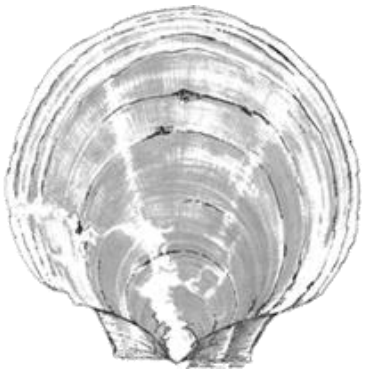
Scallop Fishery Management Plan

Evaluation of Rotational Management



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1.0 EXECUTIVE SUMMARY

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2.4 ACRONYMS

ABC	Acceptable Biological Catch
ACL	Annual Catch Limit
AIM	An Index Method of Analysis
ALWTRP	Atlantic Large Whale Take Reduction Plan
AM	Accountability Measure
ANPR	Advanced Notice of Proposed Rulemaking
AP	Advisory Panel
APA	Administrative Procedures Act
APL	Annual Projected Landings
ASMFC	Atlantic States Marine Fisheries Commission
B_{MSY}	Biomass that allows for catches equal to Maximum Sustainable Yield when fished at F_{MSY}
BiOp, BO	Biological Opinion, review of potential effects of a fishery on Protected Resource species
CAI	Closed Area I
CAII	Closed Area II
CEQ	Council on Environmental Quality
CPUE	Catch per unit of effort
d/K	Discard to kept catch ratio
DAM	Dynamic Area Management
DAS	Day(s)-at-sea
DFO	Department of Fisheries and Oceans (Canada)
DMF	Division of Marine Fisheries (Massachusetts)
DMR	Department of Marine Resources (Maine)
DPWG	Data Poor Working Group
DSEIS	Draft Supplemental Environmental Impact Statement
EA	Environmental Assessment
EEZ	Exclusive economic zone
EFH	Essential fish habitat
EIS	Environmental Impact Statement
EO	Executive Order
ESA	Endangered Species Act
F	Fishing mortality rate
FEIS	Final Environmental Impact Statement
FMP	Fishery management plan
FW	Framework
FY	Fishing year
GARFO	Greater Atlantic Regional Fisheries Office
GARM	Groundfish Assessment Review Meeting
GB	Georges Bank

GIS	Geographic Information System
GOM	Gulf of Maine
GRT	Gross registered tons/tonnage
HAPC	Habitat area of particular concern
HPTRP	Harbor Porpoise Take Reduction Plan
IFM	Industry-funded monitoring
IFQ	Individual fishing quota
INCI	Incidental permit
ITQ	Individual transferable quota
IVR	Interactive voice response reporting system
IWC	International Whaling Commission
LA	Limited access
LAGC	Limited access general category
LOA	Letter of authorization
MA	Mid-Atlantic
MAFAC	Marine Fisheries Advisory Committee
MAFMC	Mid-Atlantic Fishery Management Council
MMPA	Marine Mammal Protection Act
MPA	Marine protected area
MRI	Moratorium Right Identifier
MRIP	Marine Recreational Information Program
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MSY	Maximum Sustainable Yield
NEAMAP	Northeast Area Monitoring and Assessment Program
NEFMC	New England Fishery Management Council
NEFOP	Northeast Fisheries Observer Program
NEFSC	Northeast Fisheries Science Center
NEPA	National Environmental Policy Act
NGOM	Northern Gulf of Maine
NLS-N	Nantucket Lightship North
NLS-S-deep	Nantucket Lightship South Deep
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
OBDBS	Observer database system
OLE	Office for Law Enforcement (NMFS)
OY	Optimum yield
PBR	Potential Biological Removal
PDT	Plan Development Team
PRA	Paperwork Reduction Act
RFA	Regulatory Flexibility Act
RMA	Regulated Mesh Area
RPA	Reasonable and Prudent Alternatives
SA	Statistical Area
SAFE	Stock Assessment and Fishery Evaluation
SAP	Special Access Program
SARC	Stock Assessment Review Committee
SAS	Stock Assessment Subcommittee
SAW	Stock Assessment Workshop
SBNMS	Stellwagen Bank National Marine Sanctuary
SIA	Social Impact Assessment
SNE	Southern New England

SNE/MA	Southern New England-Mid-Atlantic
SSB	Spawning stock biomass
SSC	Scientific and Statistical Committee
TAL	Total allowable landings
TED	Turtle excluder device
TEWG	Technical Expert Working Group
TMS	Ten minute square
TRAC	Transboundary Resources Assessment Committee
USCG	United States Coast Guard
USFWS	United States Fish and Wildlife Service
VMS	Vessel monitoring system
VEC	Valued ecosystem component
VPA	Virtual population analysis
VTR	Vessel trip report
WGOM	Western Gulf of Maine
YPR	Yield per recruit

3.0 BACKGROUND AND PURPOSE

3.1 BACKGROUND

Amendment 10 to the Atlantic Sea Scallop Fishery Management Plan (FMP), implemented in 2004, introduced a formal adaptive rotation area management strategy with the intent to utilize spatial management of scallops to improve yield and minimize impacts on other fisheries and habitat (NEFMC, 2003). The Amendment codified spatial allocation of fishing effort to four types of areas within the scallop resource: 1) "open areas" where scallop fishing can occur using Days-At-Sea (DAS) or quota; 2) areas permanently closed to scallop fishing year round to reduce impacts on essential fish habitat or groundfish mortality; 3) areas temporarily closed to scallop harvest to protect small scallops until a future date; and 4) areas open to restricted levels of scallop fishing, called "access areas" (NEFMC, 2019).

Amendment 10 included several objectives to address management issues related to improving scallop yield and reducing finfish bycatch and habitat impacts that are relevant to the rotational area harvest strategy. Objective 1, *"Improve yield and rebuilding potential by reducing mortality on small scallops,"* was focused on postponing harvest of incoming year classes until they reached an optimum size for maximizing yield. Objective 2, *"Reduce reliance on DAS allocations to control fishing mortality, either by area-based management, by output controls, and/or gear restrictions. Improve the ability of the FMP to meet mortality targets and achieve optimum yield by increasing the proportion of scallop fishing that falls within controlled access programs,"* considered the uncertainty of DAS management and emphasized the need to use controlled area-based management to reduce the risk of exceeding fishing mortality targets. Objective 4, *"Reduce and/or minimize bycatch mortality and habitat impacts,"* focused on alternatives to reduce finfish bycatch and adverse effects of scallop fishing on habitat through spatial management. Objective 7, *"To continue controlled access to groundfish closed areas, consistent with groundfish rebuilding and habitat protection objectives in the context of area rotation management,"* recognized the potential benefits of allowing scallop harvest within groundfish closed areas through area rotation without causing unacceptable bycatch mortality and habitat impacts. The Council adopted a "fully adaptive" rotational approach that provides flexibility to define future rotational areas with no pre-defined conditions for closures and re-openings, except that *"areas will close when the expected annual increase in exploitable biomass in an area exceeds 30%, and areas will re-open when the expected annual increase in exploitable biomass in an area is less than 15%"* (NOAA, 2004). The growth criteria were established to define times when stock structure is composed of young, fast-growing scallops or older, slower growing scallops, respectively. Amendment 10 included procedures to identify areas for closure and re-opening, including annual surveys and calculation of the "annual potential increase" of scallops in rotational management areas, defined as the percent increase in total or relative biomass that would occur during a one-year interval if no fishing occurs.

Spatial management has been an integral part of scallop fishery management by the Council, resulting in the rebuilding and conservation of a large stock (NEFSC, 2018; 2020), equitable access for permit holders (NEFMC, 2010), and one of the most lucrative fisheries in the U.S. (NMFS, 2019). Although the primary tenets of the rotational system (spatial allocation of fishing effort to maximize scallop yield and minimize bycatch and habitat impacts) have

remained in place, the program has evolved over time in response to changes in data collection, scallop abundance and spatial distribution, and fishery management actions. For example, survey data collection in access areas has been enhanced with additional survey tools and fine-scale spatial coverage, large recruitment events resulting in high density aggregations have led to changes in area boundaries (e.g., NEFMC, 2020) and multi-year extended area openings, reductions in exploitable biomass and catch rates led to the concept of "flex trips" (allocation of trips to multiple optional areas), and the Omnibus Habitat Amendment 2 revised habitat designations leading to scallop fishing in previously closed areas (NEFMC, 2018).

Incremental changes to the rotational management program have been evaluated by the Council through annual framework adjustments, but a holistic evaluation of performance of the combined changes to meet fishery management objectives outlined in Amendment 10 has not been completed. The Council has considered such an evaluation in recent years and prioritized *"the evaluation of the rotational management program"* for 2021. The evaluation documents the use of rotational management over time, with a particular emphasis on the period from March 1, 2015 to March 31, 2021. The evaluation uses existing information, such as scallop management actions and details on decision-making criteria, and data sources, including landings, revenue, effort, and observer data, to describe how the rotational management program is currently implemented in comparison to the original approach described in Amendment 10. The report includes descriptions of the outcomes and rationale for changes to the application of the program, as well as an assessment of the Council's decision-making approach for opening and closing rotational areas, consideration of the goals of other FMPs, and added flexibility measures (e.g., flex trips, broken trips, carry-over provisions, and trip trading).

3.2 PURPOSE

3.2.1 Evaluation Goals

The goals of the evaluation are to:

1. Evaluate how the original objectives (Amendment 10) of the rotational management program have been met; and
2. Evaluate how the current version of rotational management that the Council is using meets expected outcomes.

3.2.2 Evaluation Objectives

The project objectives include:

1. Document the use of rotational management with emphasis on the most recent period (2015 to 2021);
2. Assess the performance of the program relative to the primary objectives of Amendment 10 (specifically, Objectives 1, 2, 4, and 7);
3. Describe how the rotational program is currently being applied in comparison to the original approach and describe the outcomes and rationale for alternative approaches;
4. Document two-year specification actions and evaluate outcomes; and
5. Identify possible changes or areas for improvement of the rotational program.

Results from the evaluation are expected to inform the Council about performance and challenges of the rotational program, spatial and temporal harvest patterns, changes in fishery behavior in access areas over time, and trade-offs of annual and biennial specifications. The final report will identify recommendations and improvement opportunities for the Council to consider for future scallop management.

4.0 EVALUTION OBJECTIVES

4.1 OBJECTIVE 1: DOCUMENT THE USE OF ROTATIONAL MANAGEMENT WITH EMPHASIS ON THE MOST RECENT PERIOD (2015-2021)

4.1.1 History of the Scallop Fishery Management Plan

Scallops are the most important commercial bivalve species in North America and have been exploited throughout their geographical range for more than 120 years. The first recorded landings in the U.S. were in the 1880's, and for more than 50 years the fishery exploited only inshore grounds (Aldous et al., 2013). The fishery first developed off New England, when several beds were discovered near Mt. Desert Island, Maine (Smith, 1891; Premetz and Snow, 1953). In the early 1920's, scallop beds were discovered off Long Island, and the Mid-Atlantic ports became the center of the US scallop fishery (Stevenson, 1936; Naidu & Robert, 2006). The discovery of offshore beds on Georges Bank in the early 1930's (O'Brien, 1961) shifted the main focus of the US fishery, and New Bedford, MA became, and continues to be, the leading U.S. port for the sea scallop industry (Aldous et al., 2013; NOAA 2019).

A competitive fishery on Georges Bank between U.S. and Canadian vessels, starting in the 1950s, required a joint management regime through the International Commission for the Northwest Atlantic Fisheries (ICNAF; Aldous et al., 2013). This system continued to operate with limited success until 1984, when the International Court of Justice in The Hague arbitrated a boundary line (the Hague line) separating the exclusive fishing grounds of the two countries and restricted the U.S. and Canadian offshore fleets to their respective national zones (Figure 1; Aldous et al., 2013).

The Scallop Fishery Management Plan (FMP) was established in 1982 based on an alternative to address the overall long-term benefits derivable from harvesting and use of the sea scallop resource (NEFMC, 1982). The management objective was to maximize the joint social and economic benefits to the region from the continued prosecution of the fishery. The strategy selected to achieve this goal introduced controls for fishing practices, specifically minimum size (meat count) of harvestable scallops. The resource was maintained as an open access fishery without limiting the number of participants or areas of fishing effort (NEFMC, 1982). However, after ten years of unrestricted access to the scallop resource, the Council approved Amendment 4 to the FMP, establishing the Limited Access permit category and Days-At-Sea (DAS) allocations (NEFMC, 1993). The steady decline in stock under the meat count management scheme led to a change from regulating fishing practices to controlling fishing effort. The Amendment also included changes to gear regulations to improve size selection for scallops and reduce bycatch of finfish, a vessel monitoring system to track fishing effort, and the open access General Category permit class for vessels that did not qualify for Limited Access permits.

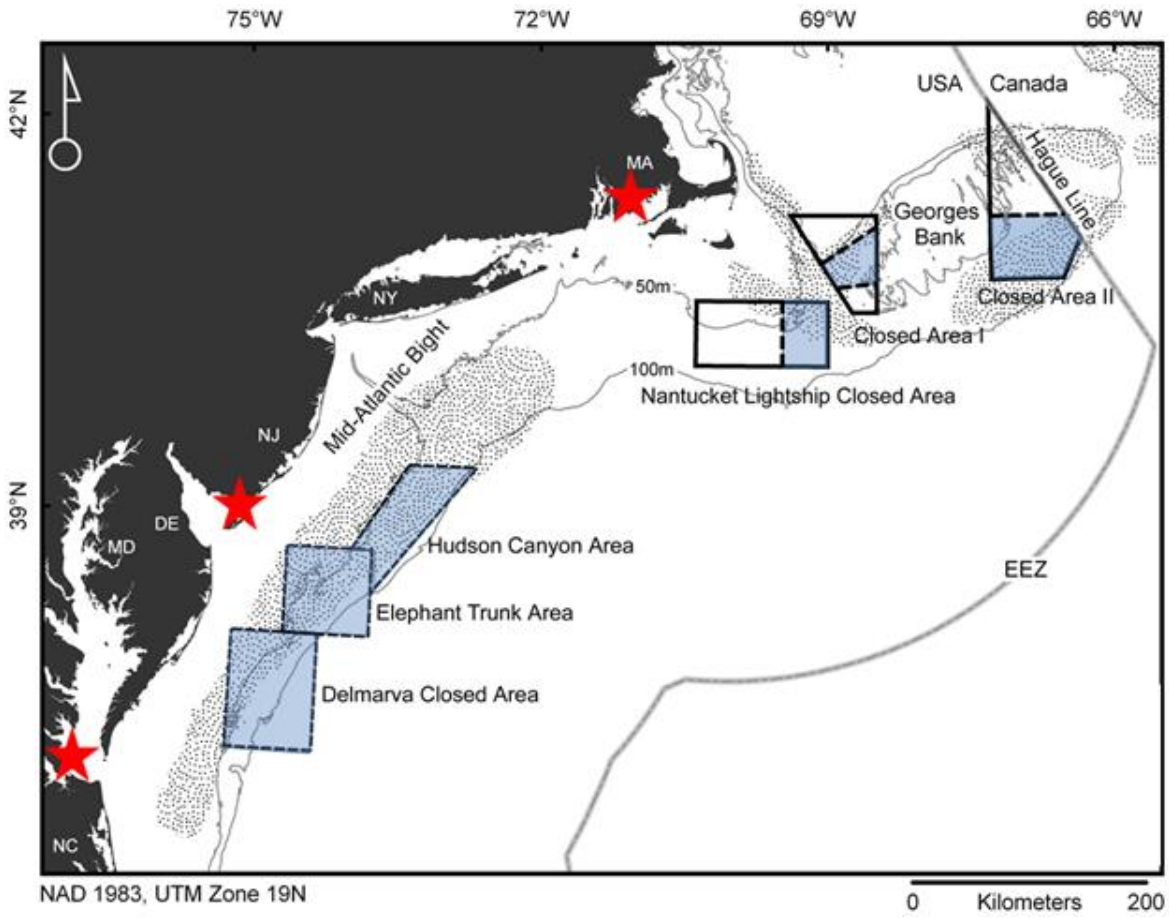

Figure 1. US sea scallop range from Cape Hatteras, North Carolina to Georges Bank and the Gulf of Maine. Stippled regions represent the major commercial scallop aggregations; dashed lines with blue shading represent the scallop access areas in Fishing Year 2014; solid black lines depict the groundfish closure areas established in 1994 on Georges Bank. The three major scallop ports of New Bedford, MA, Cape May, NJ and Newport News, VA are depicted with stars. The solid gray lines represent the 50 m and 100 m depth contours and the US EEZ.

In 1994, three large regions of Georges Bank were designated for fishing closures by the National Marine Fisheries Service in an effort to rebuild depleted groundfish stocks (Figure 1; NEFSC, 1994). This management action was implemented under the Northeast Multispecies Fishery Management Plan, but the closures restricted the use of all mobile fishing gear, including scallop dredges. High levels of fishing effort combined with the large closure regions substantially reduced the harvestable scallop resource first on Georges Bank and then in the Mid-Atlantic, and by 1996, the scallop stock was overfished, with overfishing occurring. Resource biomass projections were extremely low in 1997, and by mandate of the Magnuson Act, the management plan incorporated a ten-year rebuilding strategy that greatly reduced DAS allocations under Amendment 7 (NEFMC, 1998).

Meanwhile, scallops that were left unharvested in the closed areas of Georges Bank continued to grow and reproduce. By 1996, only two years after the areas had closed, scallop biomass in Closed Area II had tripled, and was projected to increase by another 23% by 1998 (NEFMC,

1999). The first industry-collaborative resource survey (conducted as a partnership between the fishing industry through the newly developed Fishermen's Survival Fund, the Virginia Institute of Marine Science (VIMS), the National Marine Fisheries Service, and the School for Marine Science and Technology (SMAST)) evaluated the abundance, biomass and distribution of scallops in Closed Area II in 1998 (Bernstein and Iudicello, 2000). The results of the survey provided justification for a limited fishery to harvest a portion of the large biomass in Closed Area II under Framework 11 (NEFMC, 1999). Access to the region was limited spatially and temporally, and scallopers were allocated individual landing limits. Total landings in 1999, after the opening of Closed Area II, were nearly double 1998 landings and the value of the fishery increased from $75 million to $121 million (Figure 2; NOAA Commercial Fishery Statistics). Due to the success of the access area fishery, the Council approved Framework 13 in 2000 to continue limited access fishing in the southern portion of Closed Area II and created access areas in Closed Area I and the Nantucket Lightship Closed Area (Figure 1; NEFMC, 2000; Stokesbury, 2002; Hart and Rago, 2004). A subsequent challenge against the legality of opening the access areas, which was raised by several environmental groups, was overruled based on analyses of economic benefits to the nation and potential to reduce fishing pressure in other regions of the scallop resource (*CLF v. Evans*, 2001).

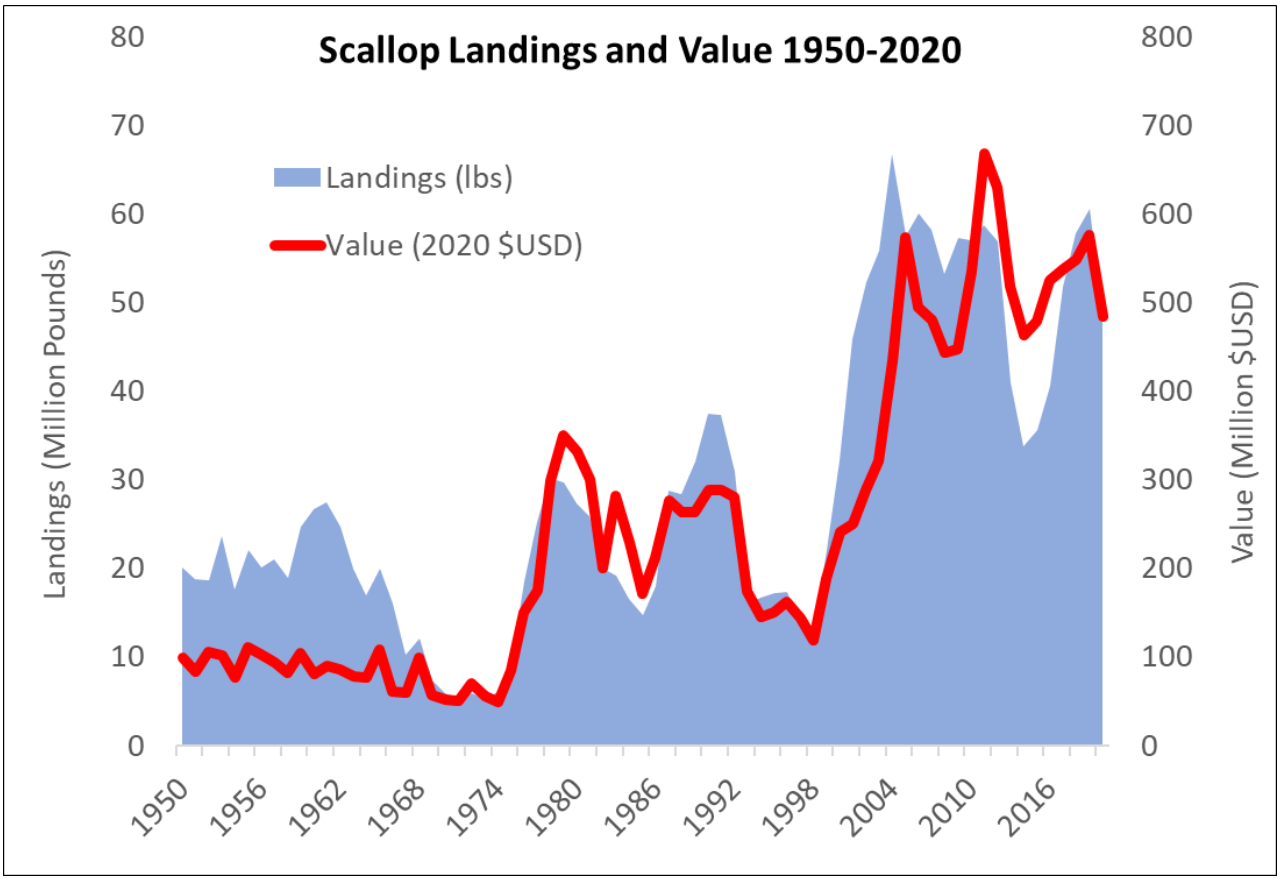

Figure 2. Scallop landings (millions of pounds) and value ($2020 USD) from 1950-2020 (data from NOAA Commercial Fishery Statistics).

Based on the observed increases in the closed areas on Georges Bank, managers proposed scallop-specific closures in the Mid-Atlantic region to protect juvenile scallops. The Hudson Canyon South Closed Area and Virginia Beach Closed Area were closed under Emergency Action by the National Marine Fisheries Service in 1998 and formally established as scallop closures under Amendment 7 to the FMP. High concentrations of juvenile scallops were observed in these regions in the 1997 Northeast Fisheries Science Center resource-wide survey. These scallops were projected to grow to harvestable size within four years, and in 2001, under Framework 14, scallopers were allowed restricted access to the regions. Landings from the Mid-Atlantic region more than doubled from 2000 to 2001 while fishing mortality remained well below the average of the previous decade (NEFMC, 2003).

Through the use of spatial and temporal closures, the scallop resource recovered in the early 2000s, leading to a steady increase in landings and revenue, which rebuilt the fishery from the verge of economic collapse. The experimental access area fisheries on Georges Bank and in the Mid-Atlantic led to the development of a new management scheme for the scallop fishery based on area rotation.

4.1.2 Amendment 10

In 2004, Amendment 10 to the FMP introduced formal rotational management of scallops. The primary intent of Amendment 10 was "*to introduce spatial management of adult scallops, taking advantage of resource heterogeneity to improve yield and minimize collateral adverse impacts on other fisheries and the marine environment*" (NEFMC, 2003). Amendment 10 was designed to spatially allocate fishing effort through area-specific Days-At-Sea (DAS) or access area trip allocations to create a more optimal distribution of fishing effort, postpone mortality on small scallops to improve yield, and reduce total fishing time to achieve fishing mortality targets by focusing fishing effort on larger, more valuable scallops in areas where the effort was more efficient (NEFMC, 2003).

The primary objectives of Amendment 10 were:

1. Improve yield and rebuilding potential by reducing mortality on small scallops.
2. Reduce reliance on DAS allocations to control fishing mortality, either by area-based management, by output controls, and/or gear restrictions. Improve the ability of the FMP to meet mortality targets and achieve optimum yield by increasing the proportion of scallop fishing that falls within controlled access programs.
3. Modify the framework adjustment process and change the fishing year to shorten the time between the availability of data and annual adjustments via the framework procedure.
4. Reduce and/or minimize bycatch mortality and habitat impacts.
5. Re-evaluate and balance the mortality associated with equal effort allocations to fishing sectors using different gears.
6. Develop a program for vessels with general category scallop permits that occasionally target sea scallops to continue this practice with restrictions on participation or the amount of scallops that these vessels may harvest.
7. To continue controlled access to groundfish closed areas, consistent with groundfish rebuilding and habitat protection objectives in the context of area rotation management.
8. Improve data collection and research on the scallop resource and fishery through a set-aside program to provide funding through industry participation.

Amendment 10 also included the following secondary objectives:

1. Re-evaluate and possibly modify the overfishing definition reference points (targets and thresholds for fishing mortality and stock biomass) to be consistent with new management policies (i.e., area rotation and/or gear modifications).
2. Improve scallop spawning potential, considering sources of variation such as oceanographic factors and man-made effects.
3. Improve total productivity for all related species in the fishery.
4. Maximize the social and economic benefits to the industry and the nation.
5. Minimize adverse impacts to the industry while rebuilding the resource.
6. Maximize industry flexibility to adjust to resource variation.
7. Minimize regulatory complexity and cost to reduce administrative costs and improve enforcement.
8. Reduce and minimize uncertainty about future regulations.
9. Minimize adverse impacts on communities, ensuring fair and equitable access to the scallop fishery.
10. Improve safety at sea.

4.1.2.1 Adaptive Rotational Management Program

The Council considered various approaches to area rotation in Amendment 10 and ultimately adopted an approach that provides flexibility to define future rotational areas. The final rule implemented a ‘‘fully adaptive area rotation scheme,’’ which allows more specific area definitions and management controls compared to the fixed-boundary alternatives considered. While the fully adaptive approach is more complicated and probably more costly to administer, it was expected to produce higher benefits by protecting small scallops during their highest growth rates. The fully adaptive area rotation scheme in Amendment 10 established no pre-defined conditions for area closures and re-openings, except *“areas will close when the expected annual increase in exploitable biomass in an area exceeds 30%, and areas will re-open when the expected annual increase in exploitable biomass in an area is less than 15%”* (NOAA, 2004). The Amendment 10 general rules for area classifications are described in Table 1, and the management policies and fishing mortality targets for rotational areas are described in Table 2.

Table 1. General management structure for area rotation management (from NEFMC, 2003).

Area type	Criteria for rotation area management consideration	General management rules	Who may fish
Closed rotation	Rate of biomass growth exceeds 30% per year if closed.	• No scallop fishing allowed • Scallop limited access and general category vessels may transit closed rotation areas provided fishing gear is properly stowed. • Scallop bycatch must be returned intact to the water in the general location of capture.	• Any vessel may fish with gear other than a scallop dredge or scallop trawl • Zero scallop possession limit
Re-opened controlled access	A previously closed rotation area where the rate of biomass growth is less than 15% per year if closure continues. Status expires when time averaged mortality increases to average the resource-wide target, i.e. as defined by the Council by setting the annual mortality targets for a re-opened area.	• Fishing mortality target set by framework adjustment subject to guidelines determined by time averaging since the beginning of the most recent closure. • Maximum number of limited access trips will be determined from permit activity, scallop possession limits, and TACs associated with the time-average annual fishing mortality target. • Transfers of scallops at sea would be prohibited	• Limited access vessels may fish for scallops only on authorized trips. • Vessels with general category permits will be allowed to target scallops or retain scallop incidental catch, with a 400 lb. scallop possession limit in accordance with general category rules.
Open	Scallop resource does not meet criteria to be classified as a closed rotation or re-opened controlled access area	• Limited access vessels may target scallops on an open area day-at-sea • General category vessels may target sea scallops with dredges or trawls under existing rules. • Transfers of scallops at sea would be prohibited	All vessels may fish for scallops and other species under applicable rules.

Table 2. Management policies and fishing mortality targets for rotation areas (from NEFMC, 2003).

Area type	Rotational management policy	Annual fishing mortality target and TAC
Closed rotation	Temporarily closed to scallop fishing	Set to zero
Re-opened, controlled access	• Area specific day-at-sea allocations and trips with possession limits and day-at-sea tradeoffs • Target TAC applies and trip allocations based on the number of trips with a possession limit calculated to achieve the target. A DAS tradeoff of 12 days will apply for each controlled access trip, no matter the actual trip length unless the trip qualifies for the broken trip adjustment exemption (Section 5.1.2.4). DAS charges will count against a combined pool of controlled access DAS allocations. • Trip allocations for part-time and occasional limited access vessels are 40% and 1/12th of the number of full-time trips that can be allocated, rounded down to the nearest whole number, but may be no less than one trip if controlled access areas are available. • Areas re-open to fishing at the beginning of the fishing year (Section 5.3.9.4), unless there is a seasonal closure to avoid unacceptably high bycatch of finfish or turtles.	Set by framework action to achieve the target mortality that the Council sets, consistent with time average guidelines, possibly following a ramped strategy to achieve optimum yield from the scallops in the re-opened area.
Open	• Open to scallop fishing under general rules • DAS allocations are determined from the target TACs consistent with the fishing mortality target at right, divided by the expected catch per DAS.	Equals a value such that the resource-wide average fishing mortality is expected to be 80% of F_{max}.

4.1.2.2 Additional Amendment 10 Measures

In addition to establishing the rotational management program, Amendment 10 implemented several management measures to support area rotation, improve scallop yield and minimize mortality on small scallops, reduce bycatch, and minimize adverse impacts on habitat. The following measures were adopted:

- <u>Area-specific Limited Access DAS and trip allocations:</u>
  - Under Amendment 10, allocations for open areas and access areas were specified separately and vessels could no longer apply open area allocations in access areas and vice versa.
  - The Amendment considered tradeoffs between DAS and scallop possession limits for access areas and determined that vessels would likely catch access area possession limits in less time than open areas due to higher catch rates. The Amendment concluded that when fishing in access areas there would be no cost to the vessel to fish in less productive zones that have lower finfish bycatch or on smoother bottom to reduce gear entanglement. Additionally, the use of a possession limit would remove the incentive to deck load scallops and fish as hard

as possible to maximize the catch per day. Tradeoff analyses determined that an 18,000-pound scallop possession limit, equivalent to a 12 DAS tradeoff, was optimal, and no hard TACs would be applied for access areas.

- Gear restrictions:
  - Amendment 10 increased the minimum ring size for all scallop permitted vessels to 4 inches in diameter and required the use of twine tops with mesh no less than 10 inches.

- One to one exchanges of access allocations:
  - Amendment 10 allowed Limited Access vessels to exchange access area trips with one or more other Limited Access vessels, including vessels having the same ownership.
  - The Amendment determined that trip exchange would reduce the adverse economic and community impacts of area-specific allocations, which might prevent a vessel from fishing in access areas or force vessels to land at distant ports.

- Carry over days:
  - Amendment 10 allowed carry over of up to 10 unused open area DAS from the previous fishing year to be used in open areas in the subsequent year.

- Broken trip exemption:
  - Amendment 10 allowed vessels to terminate trips in access areas for emergency, weather, or other conditions and receive credit to complete the trip at a later time within the same fishing year.
  - The Amendment included several provisions to "prevent abuse" of the broken trip allowance by charging DAS and actual time at sea even if the vessels had no landings.

- Set-asides:
  - Amendment 10 established a one percent set-aside to provide funding to increase Observer Program sampling frequency to cover the entire fishery, including access areas and open areas. The amendment also included a two percent set-aside for cooperative industry surveys and scallop research.

4.1.2.3 Implemented Measures (2004 – 2014)

Between 2004 and 2014, there were four Amendments and ten Framework Adjustments to the scallop FMP (see the Council's Sea Scallop Management Plan website for additional details https://www.nefmc.org/management-plans/scallops). Important changes related to the rotational management program were included in the following actions:

- 2004 – Framework 16/39: joint Framework with the Northeast Multispecies plan to establish scallop access areas within the Georges Bank closed areas (Closed Area I, Closed Area II, and Nantucket Lightship Closed Area), set scallop fishery specifications for a two-year period (2004 and 2005).

- 2006 – Framework 18: set scallop fishery specifications for a two-year period (2006 and 2007) and established a seasonal closure of the Elephant Trunk Access Area to reduce potential interactions between the scallop fishery and sea turtles.
- 2007 – Amendment 11: established a limited access program with individual fishing quotas (IFQs) for qualified general category vessels.
- 2007 – Amendment 13: permanently activated the industry-funded observer program in the scallop fishery.
- 2008 – Framework 19: set scallop fishery specifications for a two-year period (2008 and 2009).
- 2011 – Amendment 15: implemented annual catch limits (ACLs) and accountability measures (AMs) for compliance with the 2007 Magnuson-Stevens Act reauthorization, revised the overfishing definition, and modified essential fish habitat (EFH) closed areas in the scallop FMP.
- 2011 – Framework 22: set scallop fishery specifications for a two-year period (2011 and 2012) in accordance with measures included in Amendment 11 for ACLs and AMs.
- 2012 – Framework 23: required use of the turtle deflector dredge and improved the effectiveness of the scallop fishery's AMs for flatfish bycatch.

During the first decade of rotational management, there were six primary access areas (Figure 1), including three on Georges Bank (Closed Area I Access Area, Closed Area II Access Area, Nantucket Lightship Access Area) and three in the Mid-Atlantic (Hudson Canyon Access Area, Elephant Trunk Access Area, Delmarva Access Area, which was established in 2007). Table 3 describes specifications for Fishing Years 2004 to 2014 and Figure 3 shows access area allocations from 2004 to 2014.

The most substantial changes in the first decade of the rotational management program were implemented through Amendment 15 (NEFMC, 2010). This plan amendment was adopted to bring the FMP in compliance with the 2007 reauthorization of the Magnuson Act by implementing annual catch limits (ACLs) and accountability measures (AMs) to prevent overfishing. The Council adopted an ACL structure for the scallop FMP where the overfishing limit (OFL) is greater than Acceptable Biological Catch (ABC); ABC is equal to overall ACL; and overall ACL is greater than Annual Catch Target (ACT; represented as OFL > ABC = ACL > ACT). The Council also adopted changes to the Essential Fish Habitat (EFH) closed areas to allow greater access to areas with high concentrations of scallops as intended in Amendment 10. The overfishing definition was modified to be more consistent with rotational area management, including a "hybrid" approach where open area F_{target} was held constant and access area F_{target} would be allowed to fluctuate with time. Amendment 15 also established a sub-ACL for yellowtail flounder caught in the scallop fishery.

Additional details about the management measures and outcomes from 2004 to 2014 are included in Section 4.4.

Table 3. Fishery specifications 2004 to 2014.

Year	Action	CA1	CAII	NLS	HC	ETA	DMV	Possession
2004	FW16, A10 and EA	Closed	2 trips	1 trip	4 trips	Closed	N/A	18,000
2005	FW16	1 trip	1 trip	Closed	3 trips	Closed	N/A	18,000
2006	FW18	Closed	3 trips: bycatch closure	2 trips: bycatch closure	open for 2005 carryover trips	Closed	N/A	18,000
2007	FW18/ FW20	1 trip	Closed	1 trip	open for 2005 carryover trips	3 trips	Closed (Jan 1, 2007)	18,000
2008	FW19	Closed	Closed	1 trip: bycatch closure	Closed	4 trips	Closed	18,000
2009	FW19	Closed	1 trip: bycatch closure	Closed	Closed	3 trips	1 trip	18,000
2010	FW21	Closed	Closed	1 trip	Closed	2 trips	1 trip	18,000
2011	FW22 and EA	1.5 trips (all vessels get 1 trip, 156 vessels get additional trip)	0.5 trips (157 vessels)	Closed (EA Mar 1, continued in FW22)	1 trip (all vessels)	converted to open area	1 trip	18,000
2012	FW22 and EA	1 trip (157 vessels get trip per FW22 and 156 get trip converted from EA closure of DMV)	1 trip (313 vesels)	0.5 trips (157 vessels)	1.5 trips (all vessels get 1 trip, 156 vessels get additional trip)	Closed (EA Dec 12)	Closed (EA May 1, reallocated 0.5 trips to CA1	18,000
2013	FW24	118 vessels (FW25 later allows unused trips to carryover to future year)	182 vessels	116 vessels	210 vessels	Closed	Closed	13,000
2014	FW25	Closed	197 vessels	116 vessels	Closed	Closed	1 trip (option for 5 DAS)	12,000

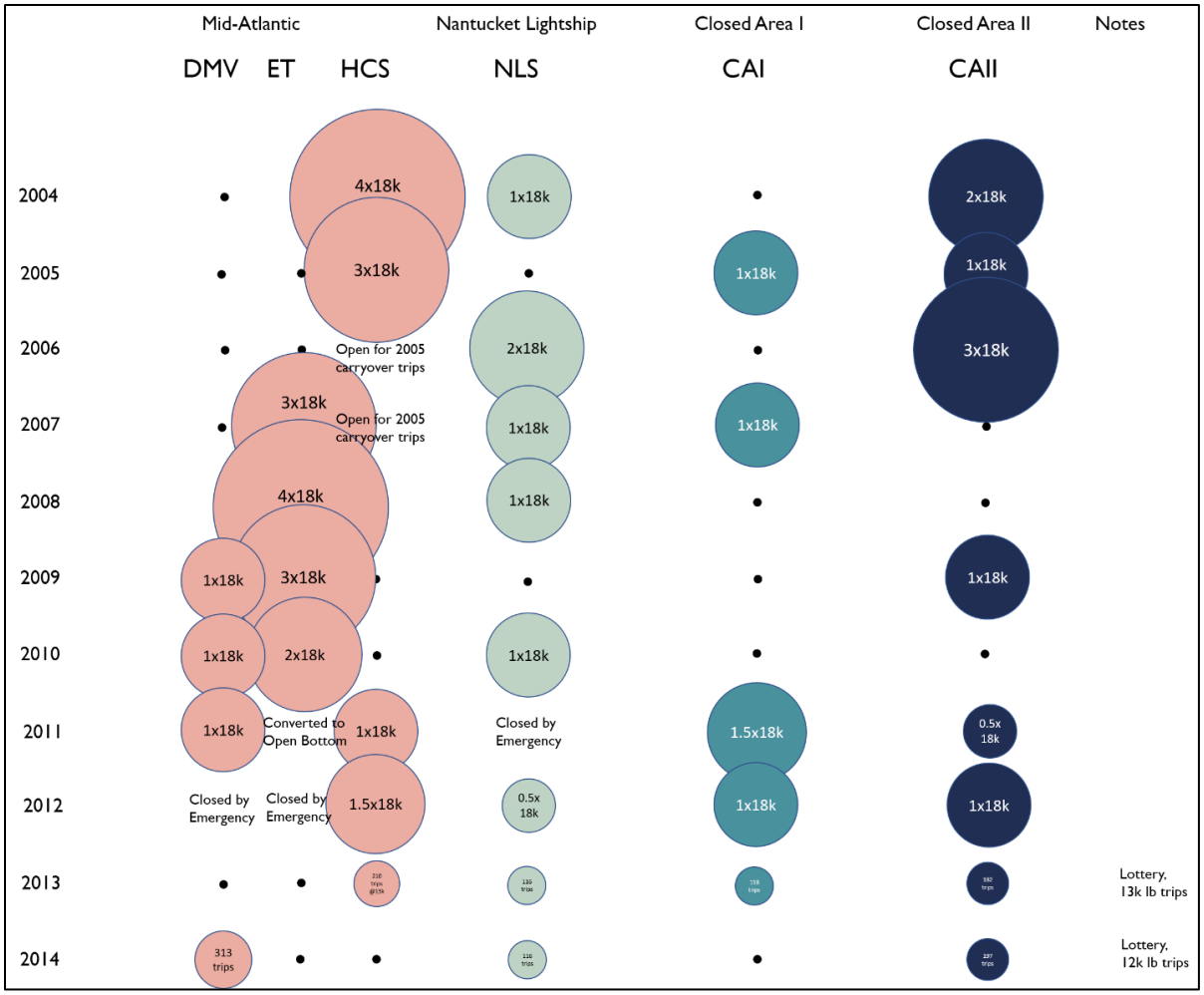

Figure 3. Rotational management access areas and allocations 2004-2014 for FT LA vessels, unless otherwise noted.

4.1.3 Current Rotational Management Program (2015 – 2021)

4.1.3.1 Rotational Area Configuration and Specifications

A substantial change to the rotational management program was implemented in 2015 under Framework 26 when the three rotational areas in the Mid Atlantic (Hudson Canyon, Elephant Trunk, and Delmarva) were combined into a single large area called the Mid Atlantic Access Area (MAAA; Figure 3), and vessels were allocated an amount of total pounds that could be harvested from the area with a maximum possession limit (NEFMC, 2015). The Council recommended this action because several potential closures within the existing Mid Atlantic access areas were explored to protect small scallops and if subareas were closed it could make fishing in remaining areas crowded and less feasible. Additionally, the flexibility associated with combining the areas was thought to potentially reduce negative impacts if one of the areas was less productive than projected, as had been observed with Mid Atlantic access areas in previous years (NEFMC, 2015). The new access area included a closure in the inshore region where small scallops were observed, which is currently referred to as Elephant Trunk Flex area.

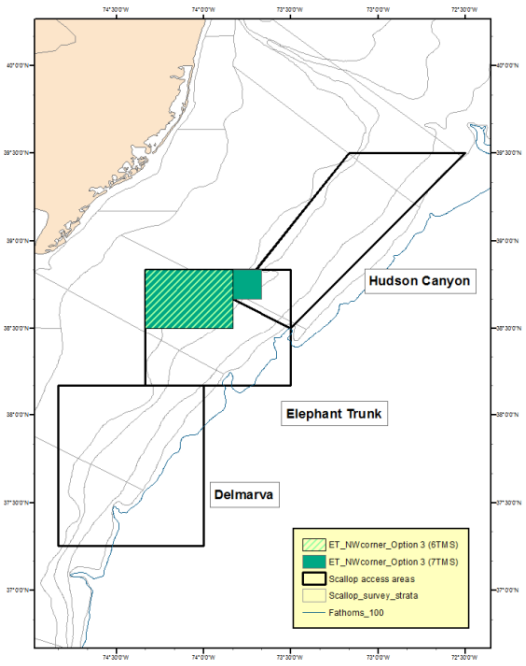

Figure 3. Mid Atlantic access areas that were combined into a single large access area (MAAA) with the Elephant Trunk Flex area in the combined green blocks (from NEFMC, 2015).

Another major change in the rotational program occurred in 2018 when the Omnibus Habitat Amendment 2 (OHA2) was approved and implemented. OHA2 provided access to portions of the Georges Bank closed areas that had not been available to the scallop fishery since before the closures in 1994, including the northern portion of Closed Area 1 and the western portion of the Nantucket Lightship Area (Figure 4).

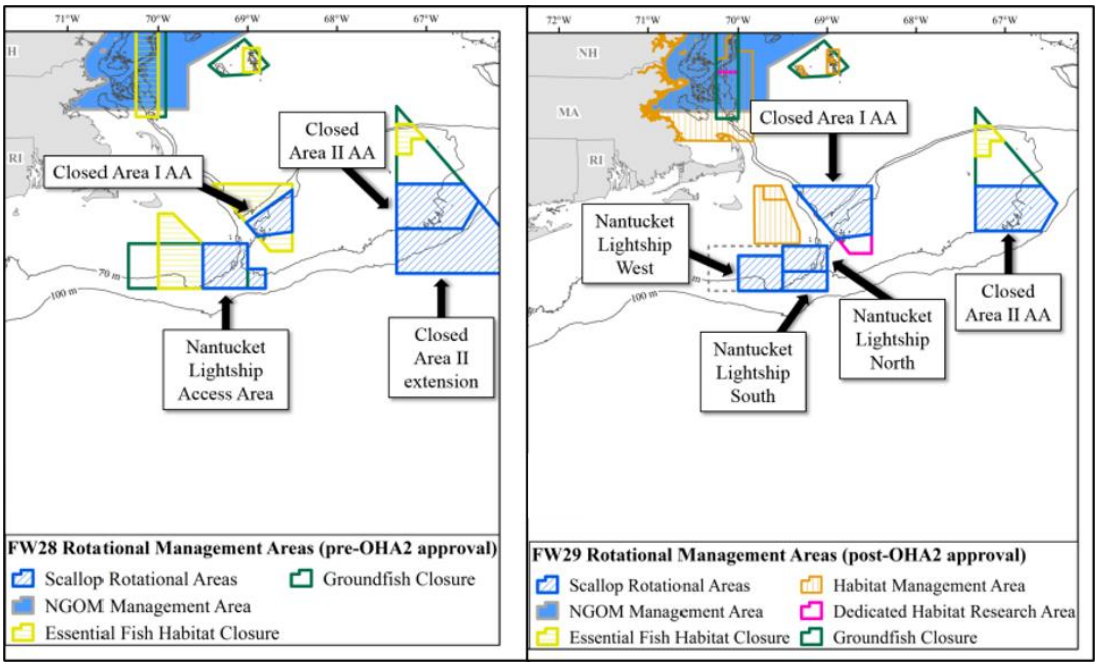

Figure 4. Rotational management areas, Essential Fish Habitat Closures, Groundfish Closures, and OHA2 management areas before (left panel) and after (right panel) implementation of OHA2 in 2018.

In addition to changes in the access area configurations, there have been several modifications to the rotational management program in recent years. Large recruitment events on both Georges Bank and in the Mid Atlantic have resulted in concentrated aggregations of scallops, which led to development of new rotational areas, increased the need for resource surveys, and required additional flexibility measures to allow harvest while maintaining mortality targets. The increased complexity of the rotational program has been reflected in scallop management actions that include a large number of analyzed alternatives and needed review for decision-making (Table 4). The number of surveys conducted per year increased from 5 in 2013 and 2014 to ~10 in 2019-2021. The total number of Council related meetings, including the Scallop PDT, Advisory Panel, Committee and Council has also increased, but total development time for annual actions has remained stable and even slightly declined. In the last five years, the implementation date for annual specifications has only been delayed twice for reasons beyond the control of the scallop FMP, including the 2018 approval of OHA2 and the 2020 pandemic. The timely implementation of the management actions is considered critically important by the scallop fishing fleet to ensure that business plans can be executed without delays.

Fishery specifications for FY2015-2021 are described in Table 5 and Figures 5 and 6. A notable difference in the rotational program between 2004-2014 and 2015-2021 is the increased allocation to the Mid Atlantic following the combination of the Mid Atlantic rotational areas. The additional rotational areas created on Georges Bank after implementation of OHA2 are reflected in Figure 5, including Nantucket Lightship West (NLS-W), Nantucket Lightship South (NLS-S), and expansion of the Closed Area I access area.

Table 4. Details of scallop management actions 2014-2021, including number of surveys conducted and total meetings held in support the annual actions.

FY-FW	Survey Data Year	# Surveys	Total Mtgs	# Alternatives	*Total Months Development	Implementation Date
FY14 - FW25	2013	5	19	6	15	16-Jun-2014
FY15 - FW26	2014	5	22	6	10	21-Apr-2015
FY16 - FW27	2015	7	25	7	12	4-May-2016
FY17 - FW28	2016	5	30	9	13	27-Mar-2017
FY18 - FW29	2017	8	28	10	12	19-April-2018**
FY19 - FW30	2018	10	28	5	13	27-Mar-2019
FY20 - FW32	2019	9	25	5	10	31-Mar-2020
FY21 - FW33	2020	9	30	9	11	5-May-2021***

* Time from initial PDT discussion to Council Final Action
** Delayed implementation due to OHA2
*** Delayed implementation due to Covid-19

Table 5. Fishery specifications 2015-2021.

Year	Action	CA1	CAII	NLS	HC	ETA	DMV	Possession	DAS
2015	FW26	Closed	Closed	Closed	(3) Merged into one Mid-Atlantic AA, closure of ETFlex			17,000	30.86
2016	FW27	Closed	Closed	Closed	(3) Merged into one Mid-Atlantic AA, closure of ETFlex			17,000	34.55
2017	FW28	Closed	1 trip	Closed (Gen Cat IFQ only)	1 MAAA, 1 ETFlex (could use in ETF or MAAA)			18,000	30.41
2018	FW29	1 trip + 2013 carryover	Closed	2 NLS-W & 1 NLS-S	(2) Mid-Atlantic AA		N/A	18,000	24
2019	FW30	1 trip (could use in CAI, NLS-W, or MAAA)	Closed	3 NLS-W	(3) Mid-Atlantic AA		N/A	18,000	24
2020	FW32	1/2 trip (could use in CAI or MAAA)	1 CAII-East	1/2 NLS N, 1 NLS-S-deep	(2) Mid-Atlantic AA		N/A	18,000	24
2021	FW33	Gen Cat IFQ only	1.5 in SW+Ext	1.5 NLS-S	(1) Mid-Atlantic AA		N/A	18,000	24

Access area allocations per vessel were relatively stable following implementation of Amendment 10 until 2012 (Figure 6). Survey biomass estimates in 2012 and 2013 indicated that biomass had declined in both the Mid-Atlantic and Georges Bank regions as large year classes from the early 2000s had been fished down and recruitment had been declining (NEFMC, 2013). The 2014 scallop surveys observed very high abundances of small scallops on Georges Bank and the Mid-Atlantic resulting from large recruitment events in 2012 and 2013, respectively. As a result, access area allocations began to increase in 2017 as the year classes reached harvestable size and peaked in 2019 with 126,000 pounds (7 trips with an 18,000-pound possession limit) of access area allocation per vessel (Figure 6). Since 2019, access area allocation per vessel has declined as the large 2013 year class in the Mid-Atlantic region has been fished down. Although the decline in biomass in the Mid Atlantic Access Area was predicted, the rate of decline has been more rapid than expected, and the access area could only support 1 trip with an 18,000 pound possession limit in Fishing Year 2021 (Table 5; Figure 5).

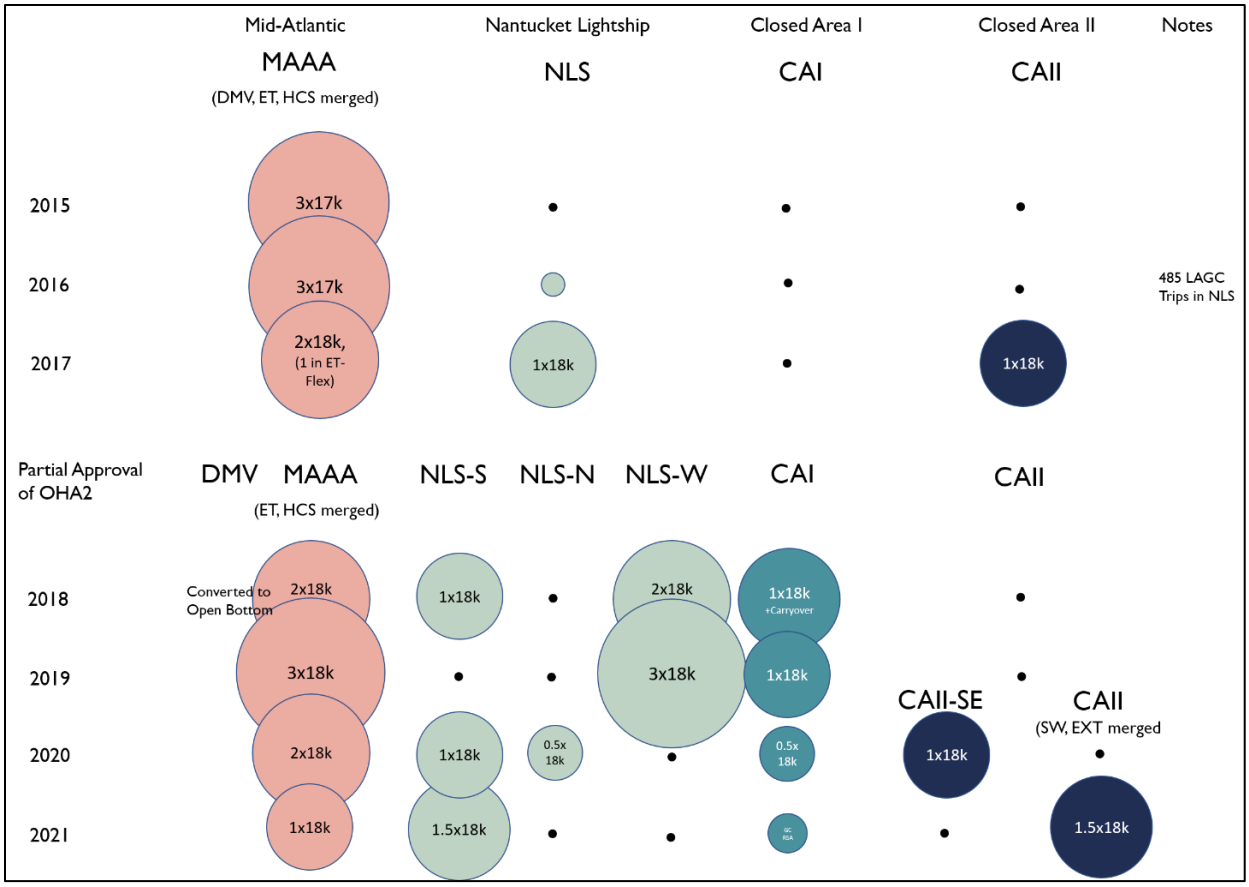

Figure 5. Rotational management access areas and allocations 2015-2021 for FT LA vessels, unless otherwise noted.

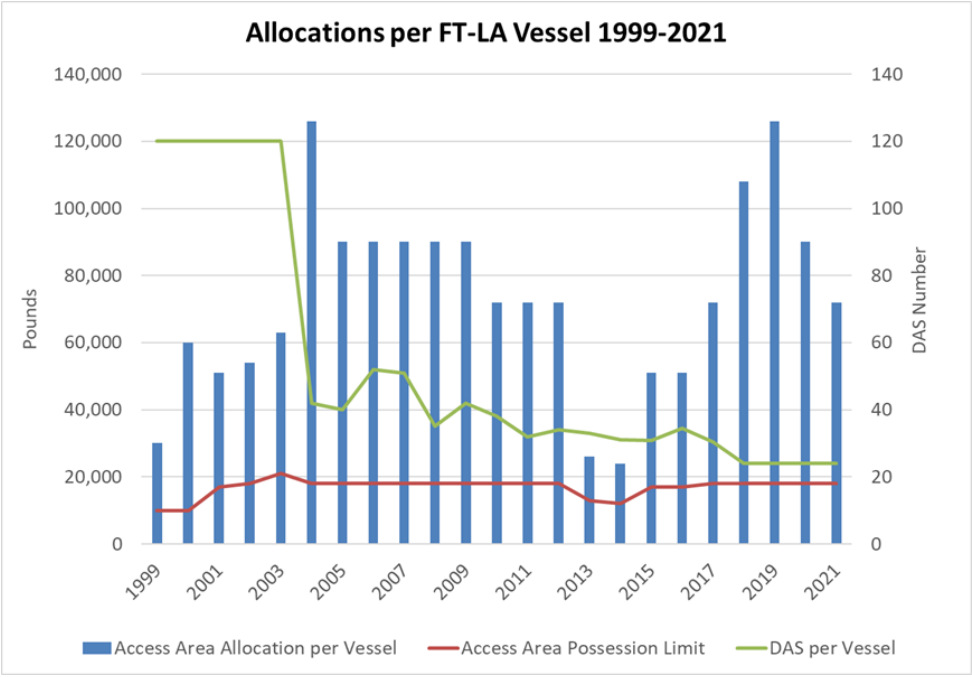

Figure 6. Scallop allocations per vessel from 1999-2021 with management actions overlaid.

4.1.3.2 Rotational Program Performance

Total fishery landings and value averaged ~50 million pounds and $525 million, respectively between 2015 and 2020 (Figure 7; Table 6). Average price per pound has declined since 2015, but average trip cost per DAS has been relatively stable (Table 6). Allocations to open areas and the Georges Bank and Mid-Atlantic access areas has been fairly equitable and value derived from the regional allocations is nearly equal in the most recent timeframe (Figure 8). In most years, the annual management measures have not been delayed beyond the start of the Fishing Year (April 1) with the exception of issues beyond the control of the scallop FMP (Table 4). Annual area configurations, survey data, biomass projections, allocations, landings, value, and LPUE for Fishing Years 2017 to 2021 are included in Appendix 1.

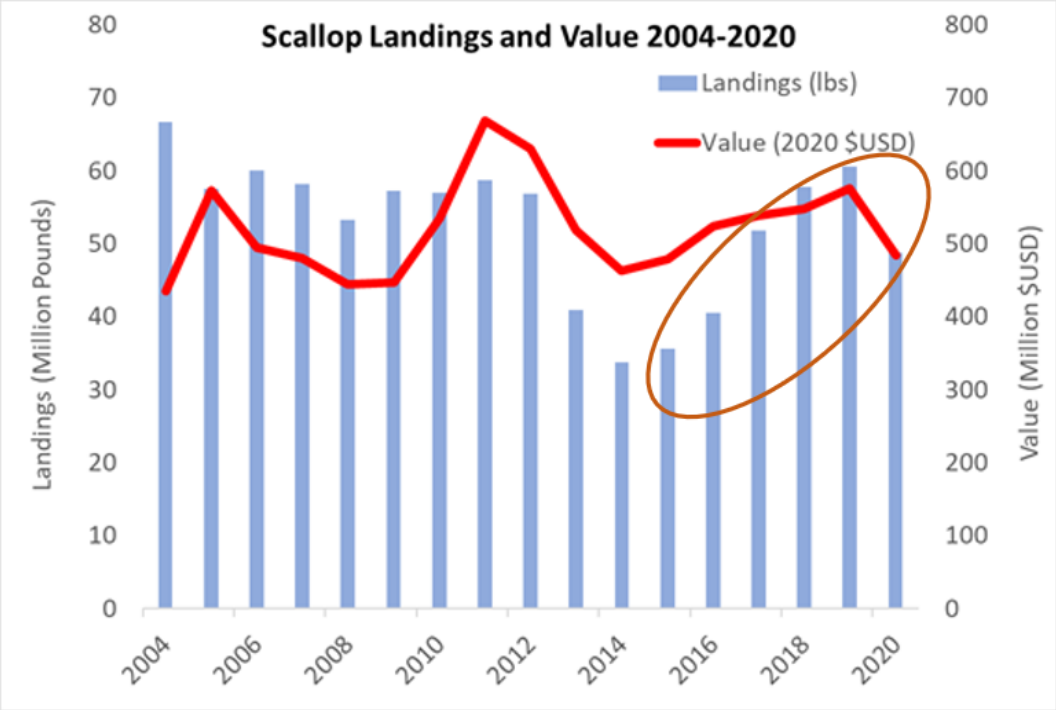

Figure 7. Scallop landings (millions of pounds) and value ($2020 USD) from 2004 to 2020 with 2015-2020 circled.

Table 6. Annual landings (pounds), value (2020 $USD), average price per pound, and trip cost per day for Full-Time Limited Access vessels from 2015-2020.

Year	Landings (lbs)	Value (2020 $USD)	Average Price/Lb	Trip Cost per Day (FT-LA)
2015	35,545,382	$478,495,131	$13.46	$1,889
2016	40,537,301	$524,387,354	$12.94	$1,669
2017	51,737,962	$538,080,071	$10.40	$1,774
2018	57,811,101	$547,744,143	$9.47	$2,019
2019	60,520,858	$575,596,700	$9.51	$1,925
2020	48,704,540	$484,040,669	$9.94	$1,756

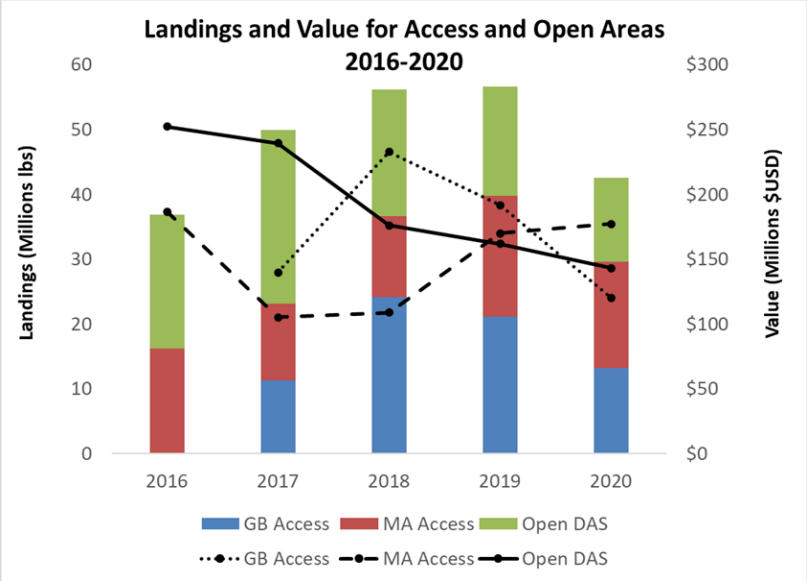

Figure 8. Access and open area landings (millions of pounds; stacked columns) and value ($USD; lines) from 2016-2020.

Stock biomass has declined in recent years as the large 2012 and 2013 year classes have been fished down and recruitment has been average or below average relative to the recruitment time series (Figures 9 and 10). The large 2012 recruitment on Georges Bank resulted in concentrated, high-density aggregations of scallops extending from the Nantucket Lightship area east across the southern flank of Georges Bank and into the southern portion of Closed Area II. Figure 11 shows results of the 2016 scallop dredge and dropcam surveys that observed the 2012 year-class as four year-olds in Nantucket Lightship and Closed Area II. Observed shell heights and meat weights of the four year-old scallops in the western and southern portions of Nantucket Lightship indicated that the scallops in this region were growing at a slower rate than scallops from the same year-class in other regions and slower than predicted for four year-old scallops generally. The slow growth rate of scallops in the Nantucket Lightship region continued, and they became known as "Peter Pan" scallops. Initial harvest of the scallops in Nantucket Lightship West occurred in 2018 with an allocation of 36,000 pounds (2 trips with 18,000-pound possession limit) per vessel. Landings in 2018 were comprised of ~15% U-10, ~50% 11-20, and ~35% 21-30 market count scallops, which were comparatively smaller market grades than landings from the 2013 year-class from the Mid-Atlantic Access Area in the same year (Figure 12). This trend was exacerbated in Fishing Year 2019 when landings from Nantucket Lightship West included only 1% U-10 market grade scallops from an allocation of 54,000 pounds (3 trips with 18,000-pound possession limit) per vessel. Surveys conducted in 2019 in the Nantucket Lightship West observed a large decline in biomass from ~106 million pounds in 2018 to ~26 million pounds in 2019 and the area was closed by FY2020 (NEFMC, 2019; NEFMC, 2020). Slow growth was also observed in the southern portion of Nantucket Lightship in depths >70m. Figure 13 shows survey length frequencies for the Nantucket Lightship South-Deep area between 2016 and 2021. Scallops in this area did not grow at all between 2017 and 2018 and again between 2019 and 2020. In 2020, this area supported one trip with an 18,000-pound possession limit, and landings were comprised of ~70% 31-40 market count scallops. By 2021, at age 10, these scallops averaged ~92mm, which is smaller than the 4" dredge ring.

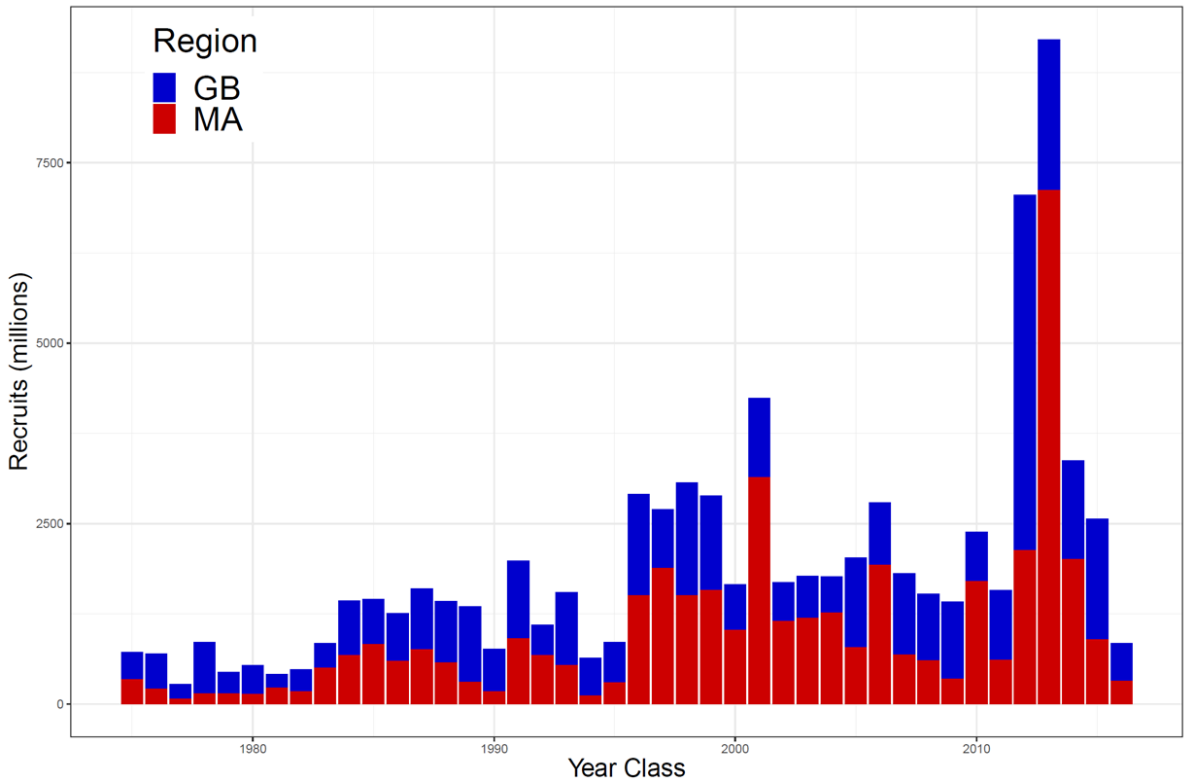

Figure 9. Recruitment (as three year-olds) in Georges Bank (blue) and the Mid-Atlantic (red) (from NEFSC, 2020).

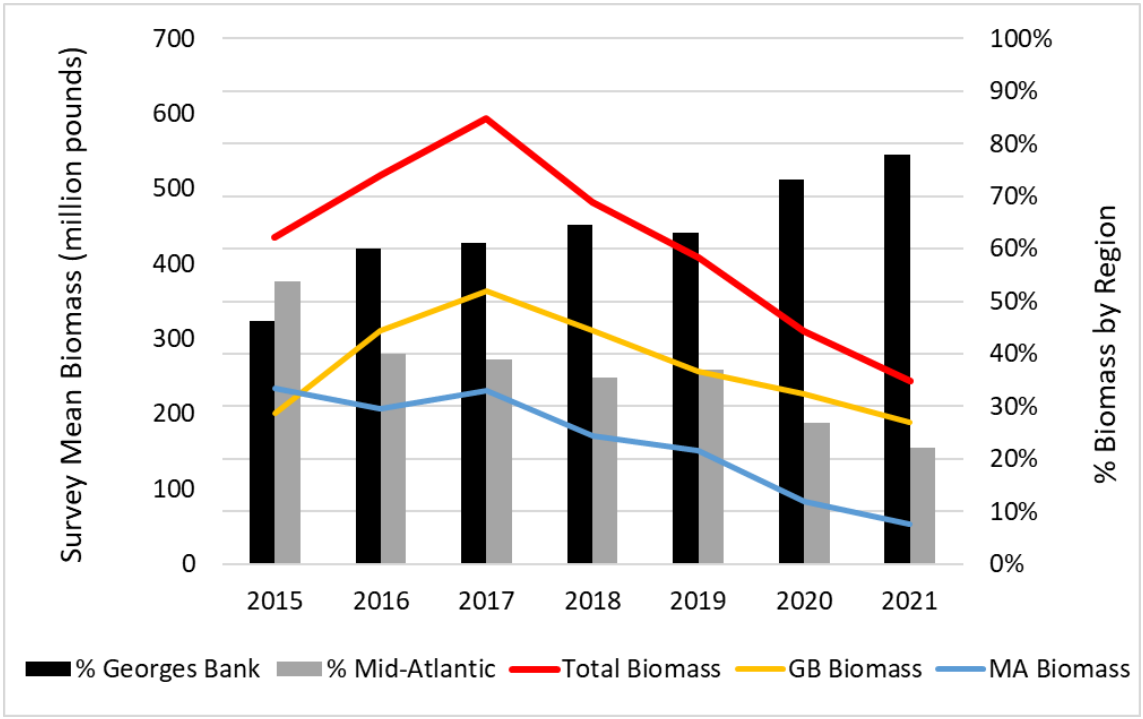

Figure 10. Survey mean biomass for the total stock (red line), Georges Bank (yellow line) and Mid-Atlantic (blue line) overlaid with percentage of stock biomass in the Georges Bank (black bars) and Mid-Atlantic (grey bars) regions.

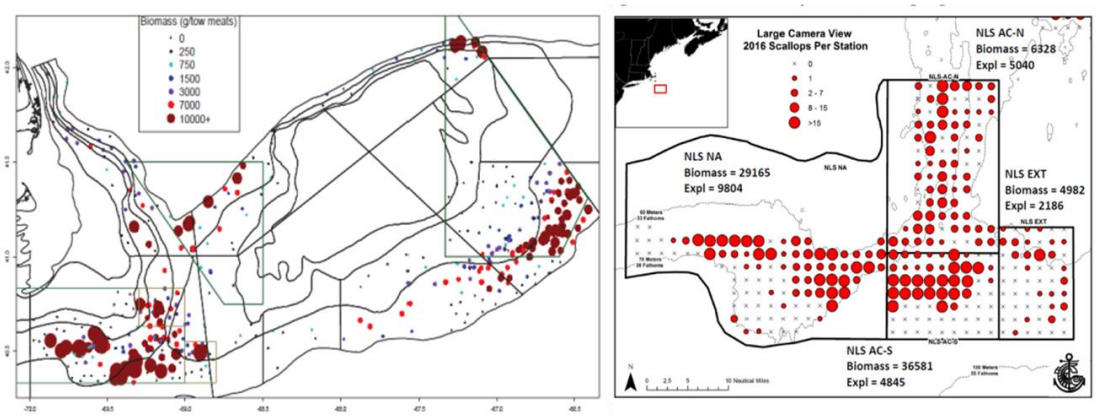

Figure 11. 2016 dredge (left) and dropcam (right) survey results for Georges Bank and Nantucket Lightship, respectively.

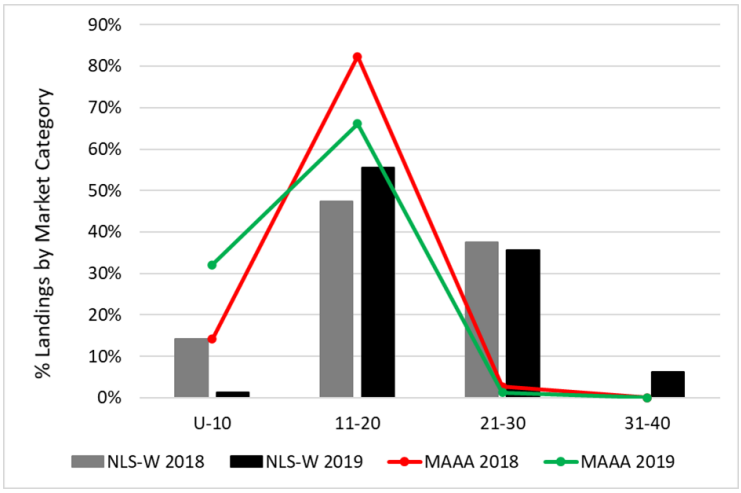

Figure 12. Percent landings by market category for Nantucket Lightship West in 2018 (grey bars) and 2019 (black bars) compared to the Mid Atlantic Access Area in 2018 (red line) and 2019 (green line).

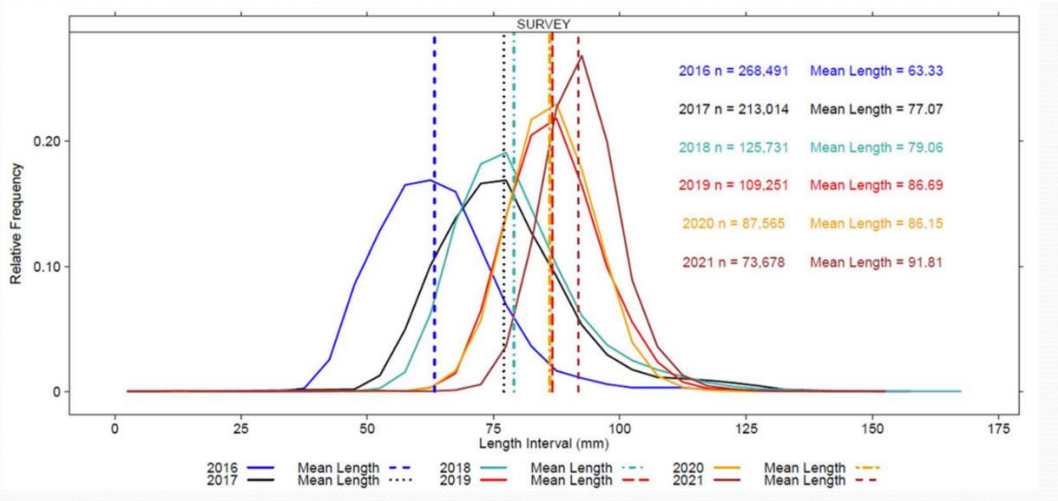

Figure 13. Survey length frequencies for Nantucket Lightship South Deep from 2016-2021.

The Mid-Atlantic Access Area supported harvest every year between 2015 and 2021 (Table 5 and Figure 5). The 2013 year-class was the largest observed in the recruitment time series (Figure 9), resulting in allocation of over 75 million pounds of scallops since 2016 (Table 7). Rotational management within this area included closing a portion of the Elephant Trunk to allow small scallops to grow while allowing harvest to occur throughout the remainder of the large access area. Similar to the Nantucket Lightship area, slower growth of scallops was observed in the high density Elephant Trunk aggregation in 2016 and 2017 but did not persist and these scallops reached harvestable size by 2018 at an average shell height of 107mm (NEFMC, 2018).

In recent years, ecological changes that can impact fishing behavior have been observed in the Mid-Atlantic region. Surveys have observed a decline in the southern-most portion of the scallop resource range since the late 2000s starting in the Virginia Beach area and extending northward over the last decade. Total survey biomass in 2015 in the Delmarva area was ~36 million pounds, which decreased to ~11 million pounds in 2016 and ~8 million pounds in 2017. The Delmarva portion of the Mid-Atlantic Access Area was reverted to open bottom in FY2018, and survey biomass estimates have continued to decline (VIMS, 2021; Figure 14). In addition to the truncation of the southern resource extent, parasites and disease have become more prevalent in the Mid-Atlantic region. Nematodes, which have a life cycle that includes parasitism in scallops and sea turtles, have been observed in the Mid-Atlantic since 2015 and appear to be shifting northward (VIMS, 2021; Figure 15). Although these parasites do not seem to be lethal to scallops, they affect meat quality due to the presence of lesions, which in turn has affected fishing behavior with increased discards and avoidance of areas with high infection rates. The occurrence of shell blister disease, which can impact scallop yield and result in poor quality scallop meats, has also increased in the Mid-Atlantic in recent years, and was observed in nearly 30% of scallops in the Elephant Trunk area in 2021 (VIMS, 2021; Figure 16).

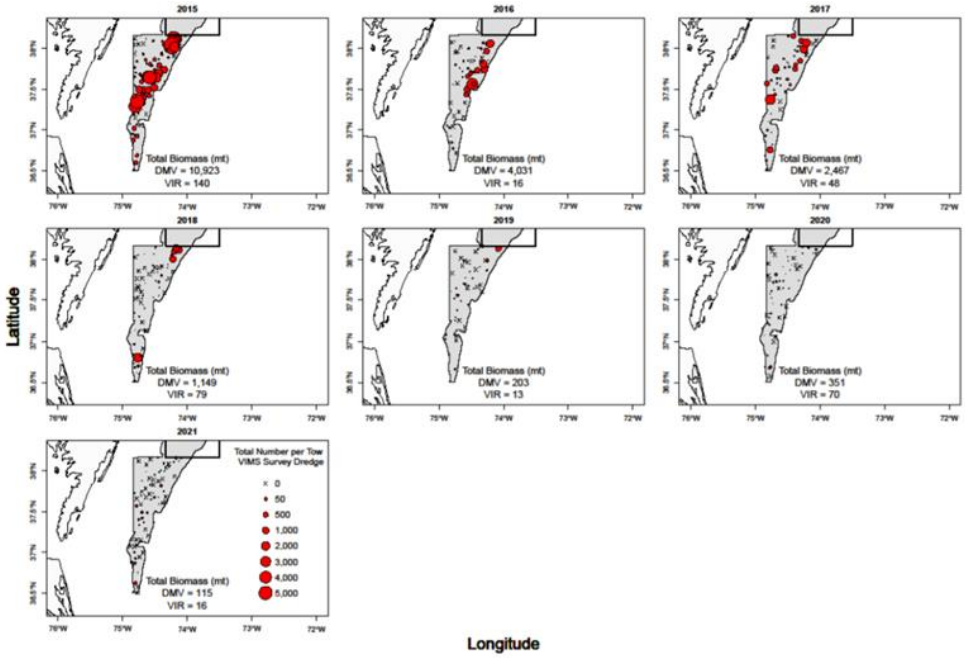

Figure 14. Spatial distribution of scallops observed in the Virginia and Delmarva areas from 2015 to 2021 from the VIMS dredge survey (from VIMS, 2021).

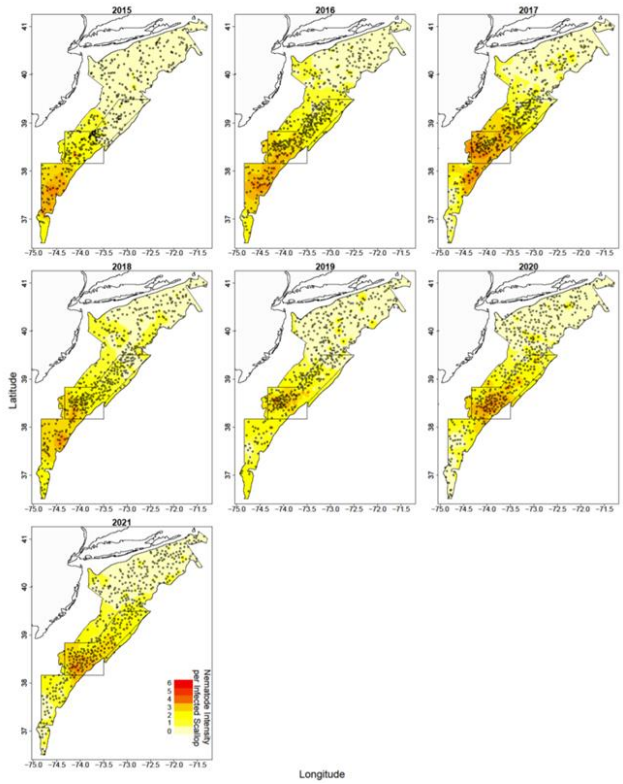

Figure 15. Intensity of nematode lesions observed in nematode-infected scallops between 2015 to 2021 from the VIMS dredge survey (from VIMS, 2021).

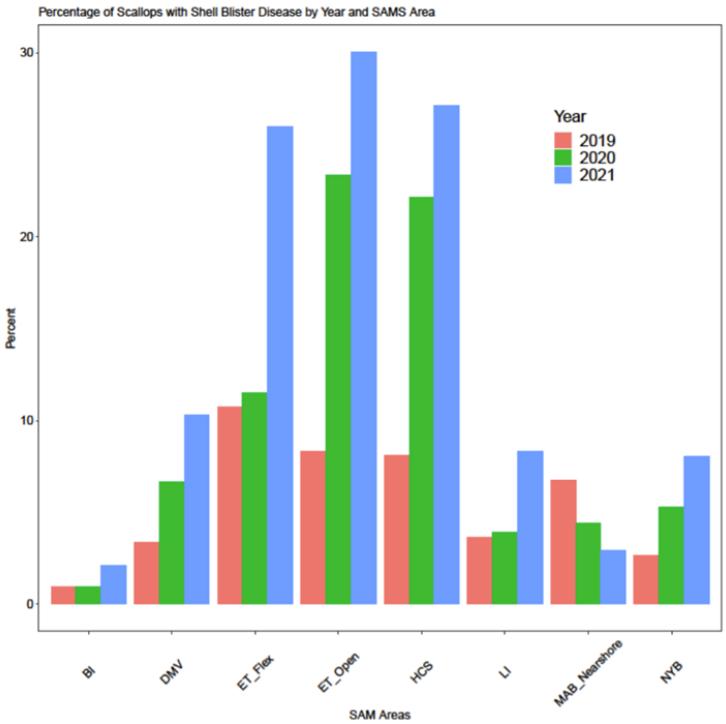

Figure 16. Percentage of scallops with shell blister disease by area from 2019-2021 from the VIMS dredge survey (from VIMS, 2021).

Annual management of scallops is based on projections of exploitable biomass and fishing effort by area using observations from the scallop survey system and fishery behavior. Projecting future biomass and fishing effort is challenging for fisheries in general and has become increasingly complex for the scallop fishery due to resource anomalies. Slow growth rates, increased natural mortality, and changes in fleet behavior have resulted in increased uncertainty in annual projections from the Scallop Area Management Simulator (SAMS) model. Figure 17 shows total survey biomass and projected exploitable biomass for the Mid-Atlantic Access Area from 2016 to 2021. The projection model applies assumed growth and mortality estimates to the observed survey total biomass to project exploitable biomass in the following year. As shown in the figure, 2016 total survey biomass was ~150 million pounds, which was projected to result in ~75 million pounds of exploitable biomass in 2017. The large difference in total and projected exploitable biomass in these years was due to the large number of small scallops in the area that were not expected to be of harvestable size in 2017. Over the next two years in the MAAA, the 2013 year-class grew to harvestable size and nearly all of the scallops observed in the surveys were projected to be "exploitable" in the following year. Between 2019 and 2020, observed total biomass declined by over 50 million, which was not projected by the SAMS model. Another large decline was observed between 2020 and 2021, which was also not projected by the SAMS model. Examination of the observed and projected spatial distribution of biomass within the MAAA shows that the Elephant Trunk Flex area declined rapidly after 2019, but projections of biomass in all areas (Elephant Tunk Flex, Elephant Tunk Open, and Hudson Canyon) were overly optimistic (Figure 18). The causes of the rapid decline in biomass are not definitively known, but may include increased natural, incidental, and discard mortality associated with climate and ecological changes.

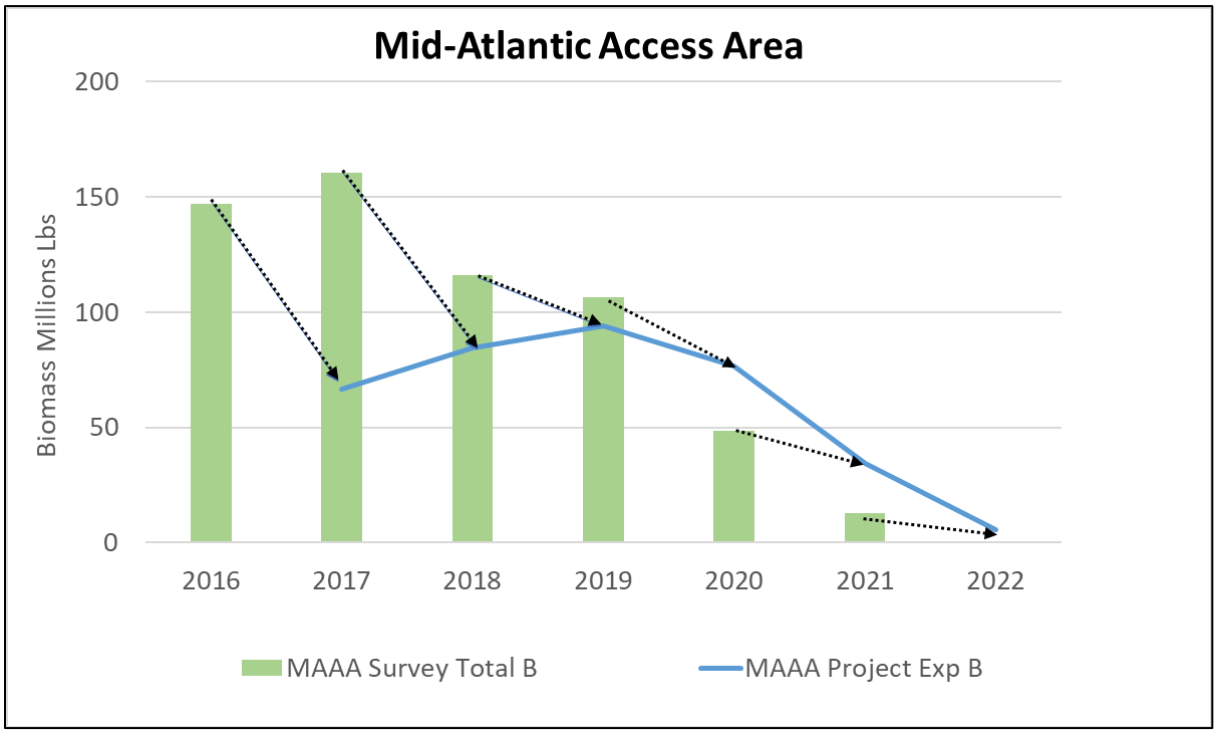

Figure 17. Mid-Atlantic Access Area total survey biomass (green bars) and projected exploitable biomass (blue line) from 2016 to 2021 overlaid with differences between projected and observed (black dashed lines).

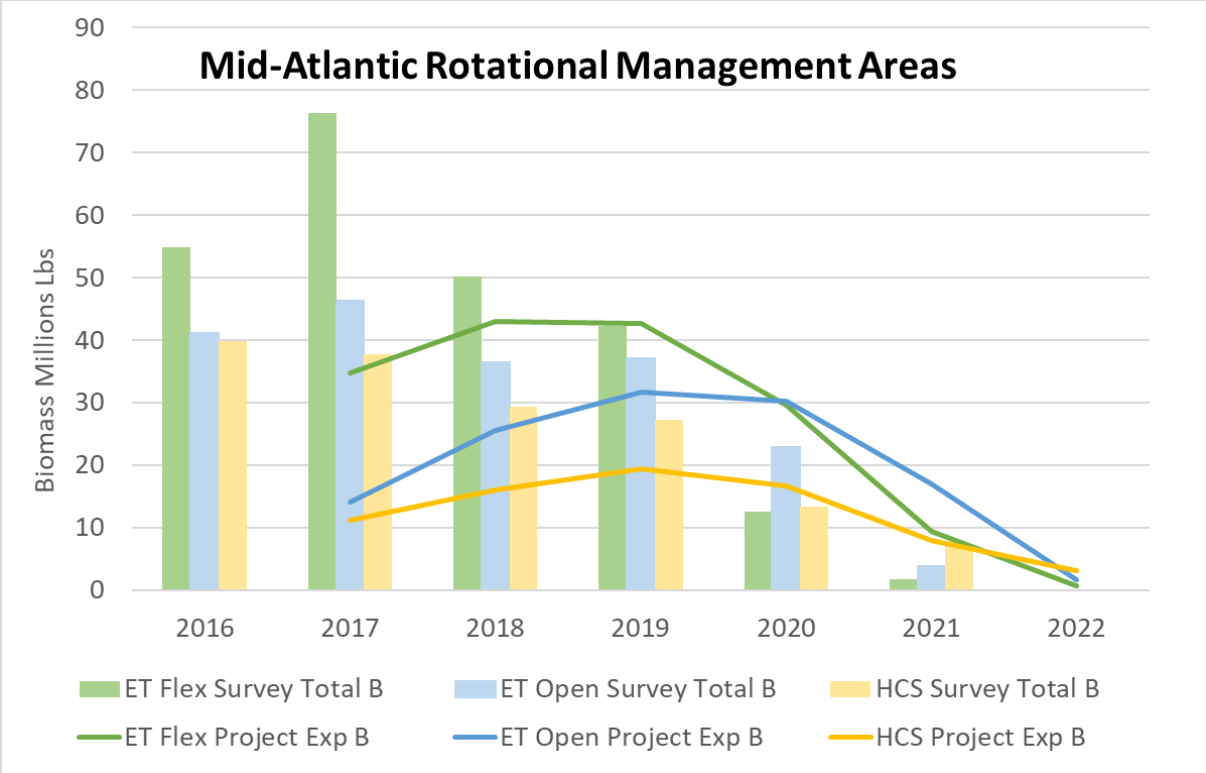

Figure 18. Mid-Atlantic rotational management areas (Elephant Trunk Flex (ET Flex), Elephant Trunk Open (ET Open) and Hudson Canyon (HCS) total survey biomass (columns) and projected exploitable biomass (lines) from 2016 to 2021.

Generally, the rotational management program has met expected outcomes in recent years. Sustained high landings, LPUE, large market categories, and high prices have resulted in socioeconomic benefits between 2015 and 2021. Stock biomass has declined but remains well above the overfished threshold and overfishing has not occurred. Large recruitment events on Georges Bank and in the Mid-Atlantic, combined with changes to rotational area configurations and added flexibility measures have supported continued high levels of annual allocation. Increased complexity, however, related to high density aggregations, anomalous growth rates, and changing fishing behavior has presented new challenges to the rotational management program and increased uncertainty in biomass projections. Additionally, recruitment has been average or below average in recent years, limiting the options for area rotation. Future rotational management will need to consider the changing environment and potential impacts on the scallop resource and fishery footprint.

4.2 Objective 2: Assess the Performance of the Program Relative to the Primary Objectives of A10

Amendment 10 included eight primary objectives, listed in Section 4.1.2. This evaluation assessed performance of the rotational management program relative to a subset of the primary objectives, including Objectives 1, 2, 4, and 7. The evaluation was based on available scientific,

management, and fishery information with the goal of evaluating how the original objectives (Amendment 10) of the rotational management program have been met.

4.2.1 Objective 1: Improve yield and rebuilding potential by reducing mortality on small scallops

The Amendment 10 rationale for this objective stated:

> *"Fishing mortality on smaller scallops prevents the fishery from obtaining optimum yield, because too many scallops are caught before reaching optimum size. While Amendments 4 and 7 successfully improved size selection by the fishery and improved yield, more gains are possible through area rotation and possibly other management measures. During the early 1990's, the fishery focused on 3 year old scallops and few 4 year old scallops were found in the population. Now the fishery is targeting 4 and 5 year old scallops, and few 3 year old scallops are retained and landed. Area rotation promises to postpone mortality for about 3 years for areas with abundant year classes to allow the scallops to reach an optimum size for maximizing yield, at about 7 to 8 years old."*

4.2.1.1 Scallop Yield

This evaluation considered information on scallop shell height, commercial catch at size, and market category landings to assess performance of the program relative to Amendment 10 Objective 1. Figures 19 to 21 show the 2020 Catch At Size (CASA) stock assessment model estimated abundances at shell height for Georges Bank closed areas, Georges Bank open areas, and the Mid-Atlantic region. Model results indicate an increase in abundance at larger shell heights in Georges Bank closed areas following the 1994 groundfish closures and sustained high abundance of larger animals following the implementation of Amendment 10 (Figure 19). For Georges Bank open areas, estimated abundance across all shell heights increased after implementation of Amendment 10 as fishing effort became less concentrated in open areas (Figure 20). The CASA model for the Mid-Atlantic includes both access and open areas combined, but results show a similar pattern of increased abundance at shell height after the experimental closures of Virginia Beach and Hudson Canyon in 1998 and sustained high abundance at shell height following the implementation of A10. (Figure 21). Figures 19 to 21 also show increased abundance at smaller sizes, which is an indicator of recruitment. In all areas, abundance of small scallops increased following the implementation of Amendment 10. Figures 22 to 25 show commercial catch at size for Georges Bank and Mid-Atlantic open and closed areas over time, indicating retention of larger scallops from access areas than open areas, and an increasing size at retention in open areas following the implementation of Amendment 10. Figure 26 shows monthly landings by market grade from 2016 to 2021, with catch dominated by larger market grades in the last five years. Generally, these results indicate that Amendment 10 management measures, including the rotational management program and increased dredge ring size, improved yield by allowing scallops to reach larger sizes in both closed and open areas.

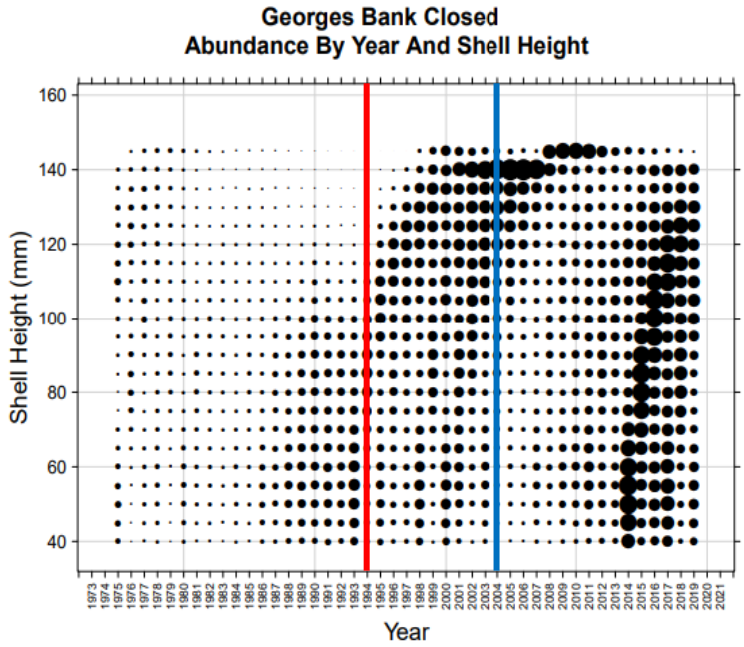

Figure 19. CASA model estimated abundances at shell height for Georges Bank closed areas. Symbol areas are proportional to abundance, the red line indicates 1994 when the Georges Bank closed areas were implemented, the blue line indicates 2004 when Amendment 10 was implemented (adapted from NEFSC, 2020).

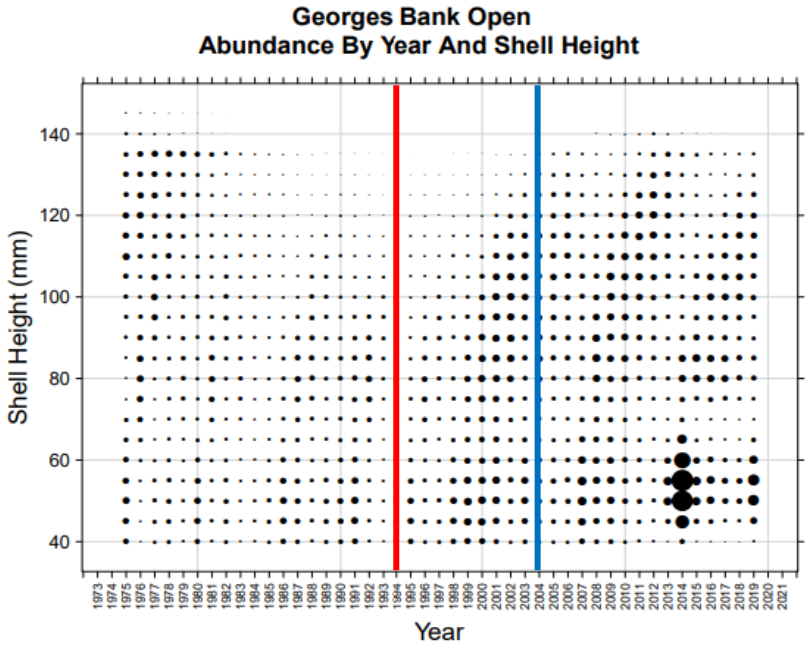

Figure 20. CASA model estimated abundances at shell height for Georges Bank open areas. Symbol areas are proportional to abundance, the red line indicates 1994 when the Georges Bank closed areas were implemented, the blue line indicates 2004 when Amendment 10 was implemented (adapted from NEFSC, 2020).

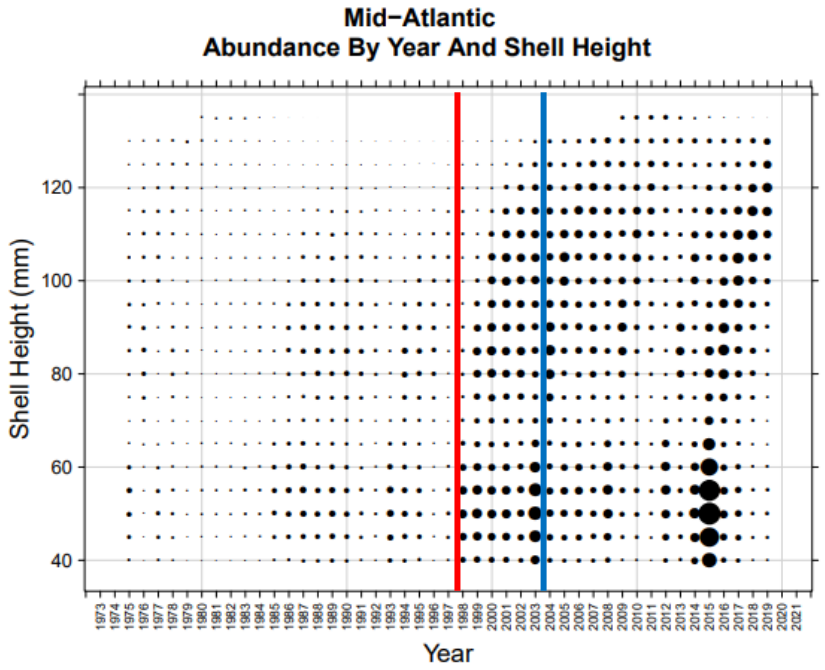

Figure 21. CASA model estimated abundances at shell height for the Mid-Atlantic. Symbol areas are proportional to abundance, the red line indicates 1998 when the Virginia Beach and Hudson Canyon closures were implemented, the blue line indicates 2004 when Amendment 10 was implemented (adapted from NEFSC, 2020).

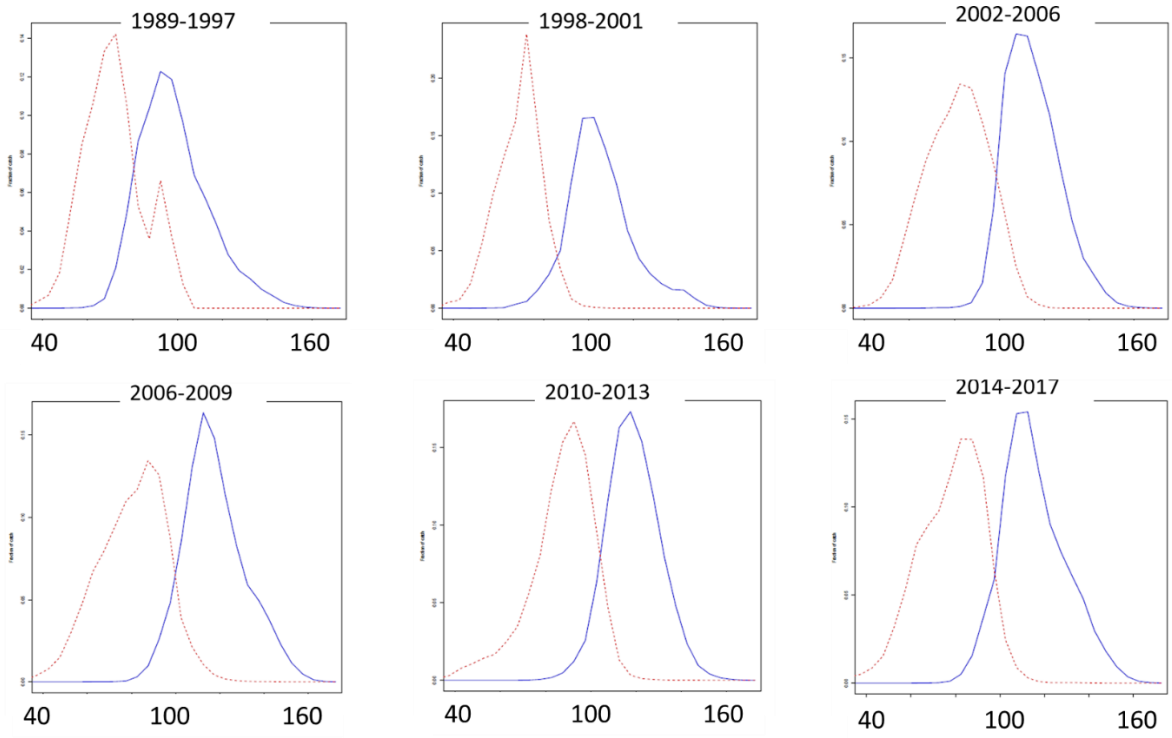

Figure 22. GB Open size frequency of commercial catch; blue is retained scallops, and red line is discarded scallops (adapted from NEFSC, 2020).

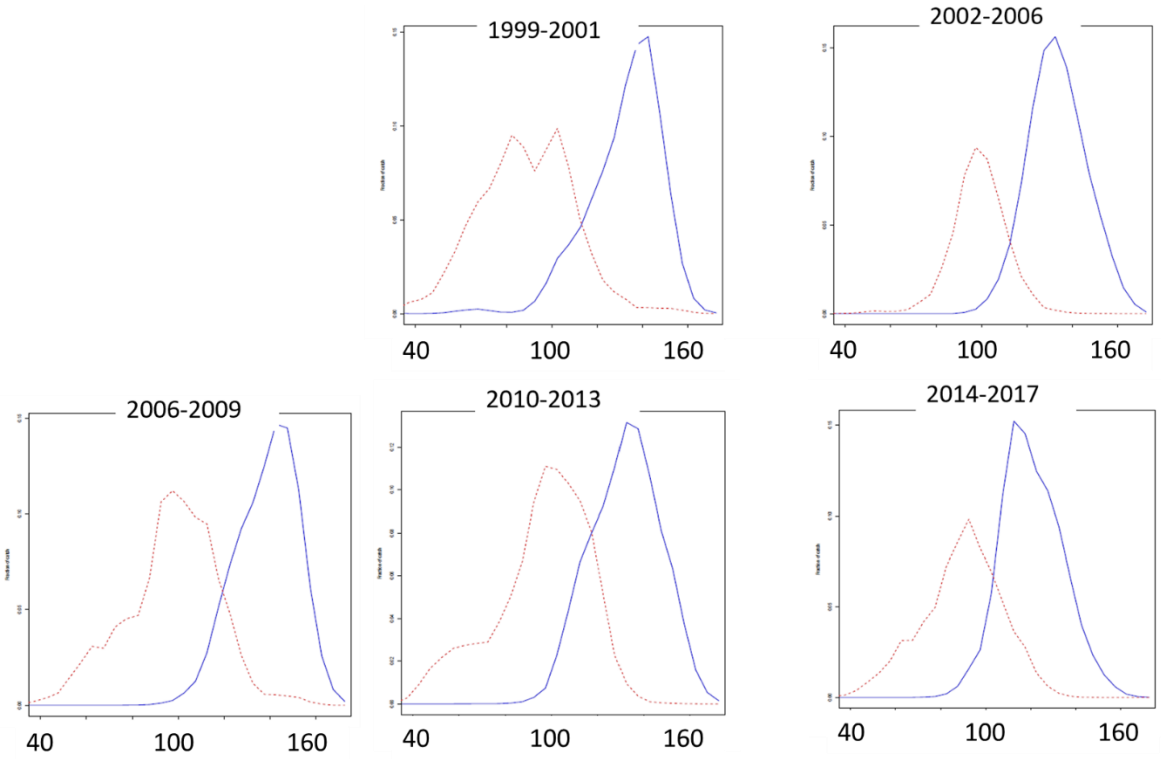

Figure 23. GB Closed size frequency of commercial catch; blue is retained scallops, and red line is discarded scallops (adapted from NEFSC, 2020).

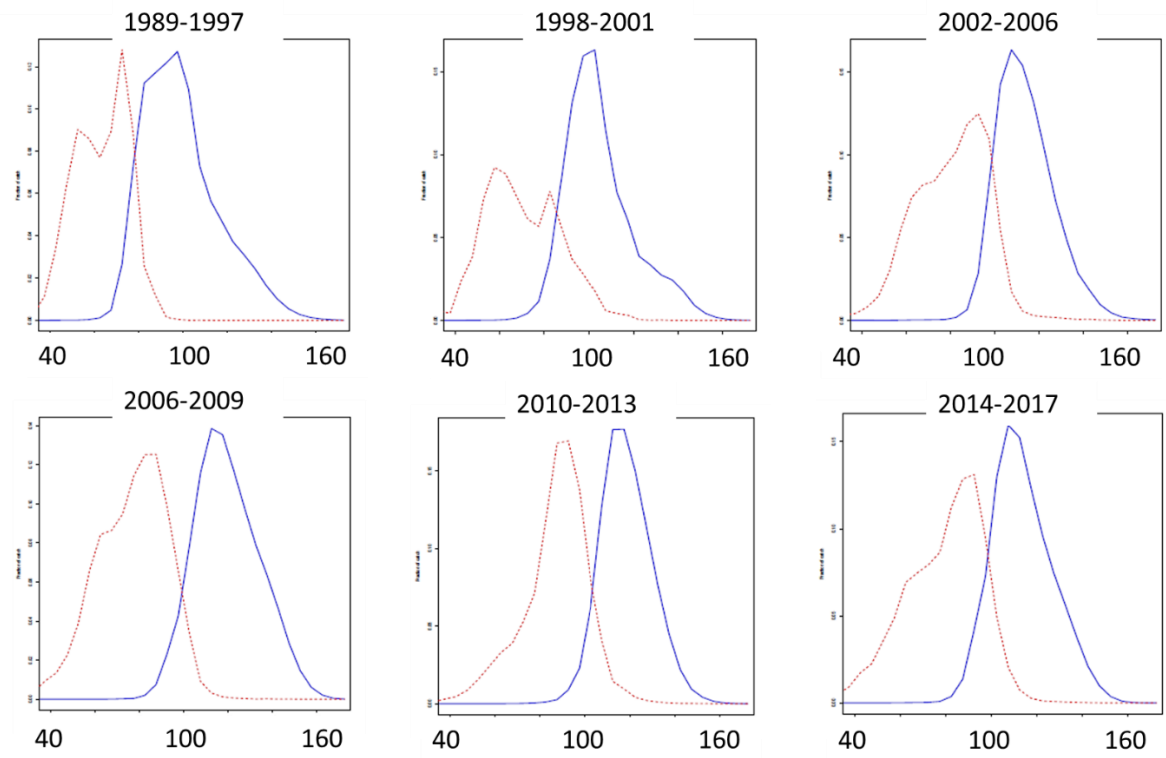

Figure 24. MA Open size frequency of commercial catch; blue is retained scallops, and red line is discarded scallops (adapted from NEFSC, 2020).

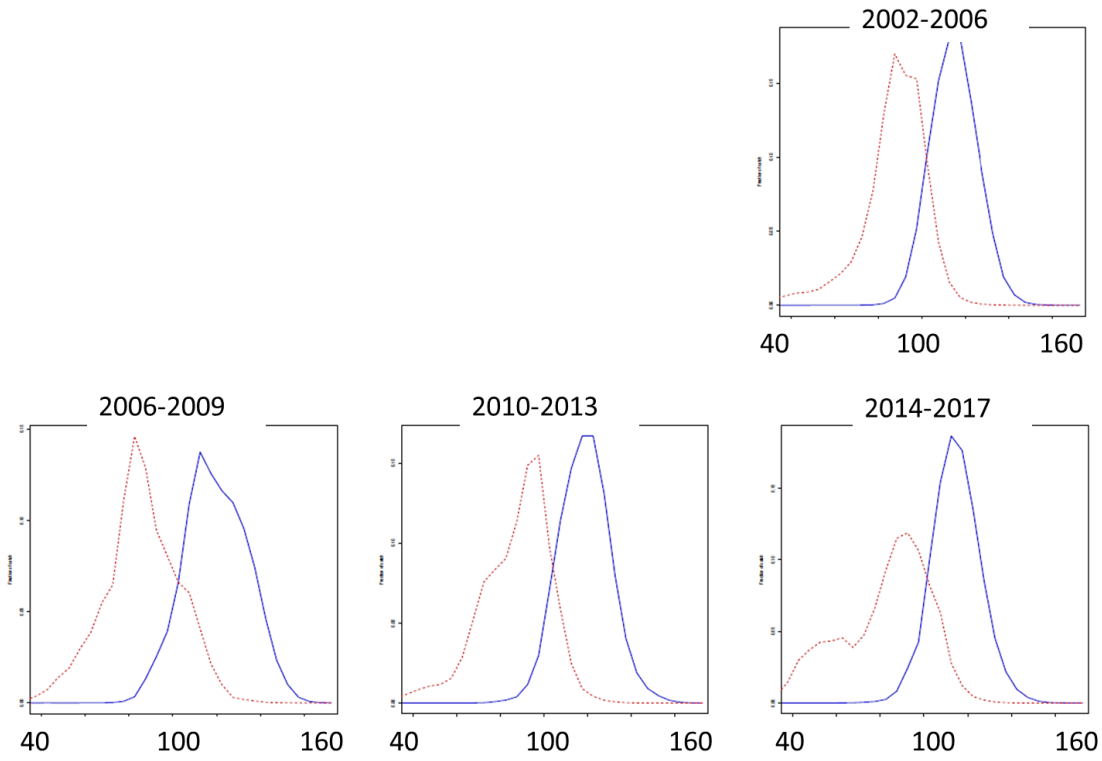

Figure 25. MA Closed size frequency of commercial catch; blue is retained scallops, and red line is discarded scallops (adapted from NEFSC, 2020).

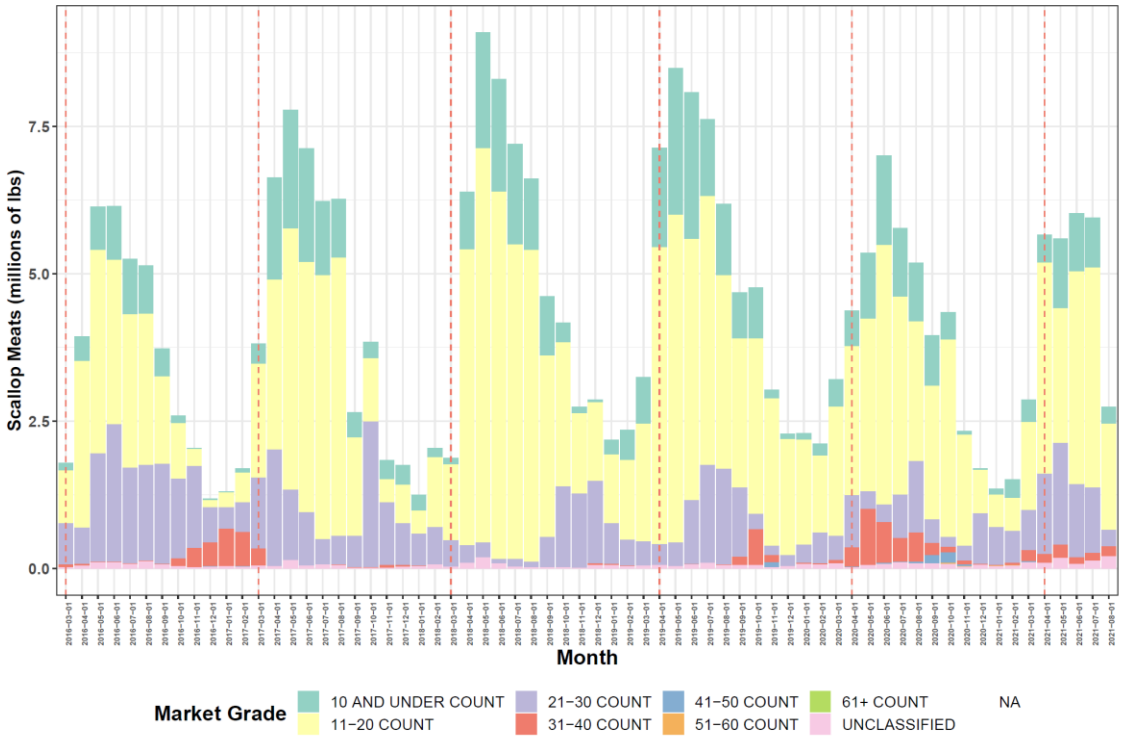

Figure 26. Monthly landings by market category (all areas combined) from 2016 to 2021.

4.2.1.2 Scallop Stock Status

In terms of the Amendment 10 objective to improve rebuilding potential, the evaluation considered scallop stock status. The sea scallop resource was assessed through a management track assessment in 2020 (NEFSC, 2020) that concluded that the scallop stock is neither overfished nor did it experience overfishing in 2019 (i.e., the terminal year of the assessment; Figure 27). For the scallop stock, overfishing is defined as F exceeding F_{MSY}, and the stock is considered overfished if biomass is less than ½ B_{MSY}. The 2020 Management Track updated the biological reference points to F_{MSY} = 0.61 and B_{MSY} = 102,675 mt (½ B_{MSY} = 51,329 mt; Table 7). A summary of the management track assessment can be found at: https://www.fisheries.noaa.gov/new-england-mid-atlantic/population-assessments/2020-management-track-assessments

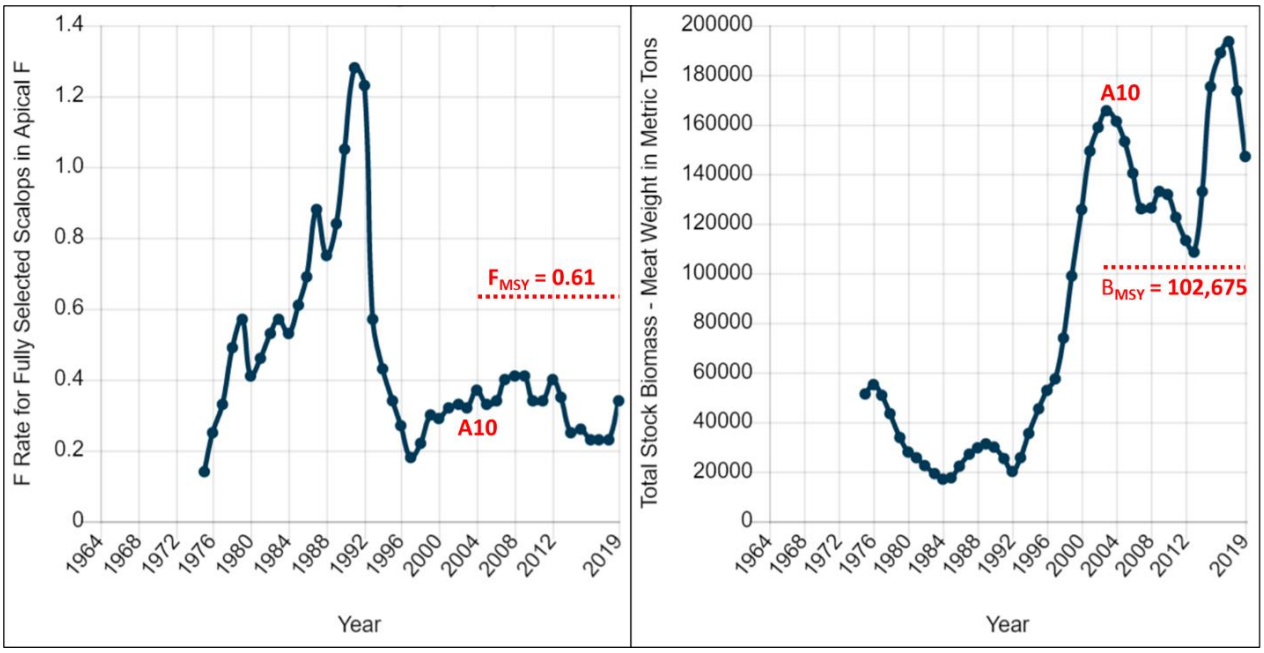

Figure 27. Fully recruited annual fishing mortality rate and total stock biomass for scallops from 1975 to 2019 overlaid with biological references points and the implementation of A10.

Table 7. Scallop stock status from stock assessments conducted since implementation of A10.

Biological Reference Points	SARC 39 (2004)	SARC 45 (2007)	SARC 50 (2010)	SARC 59 (2014)	SARC 65 (2018)	2020 Management Track
F reference point	F=0.24	F=0.29	F=0.38	F=0.48	F=0.64	F=0.61
B reference point	N/A	109,000 mt	125,358 mt	96,480 mt	116,766 mt	102,657 mt
Stock B	N/A	166,200 mt	129,703 mt	132,561 mt	317,334 mt	147,073 mt
Overfished?	No	No	No	No	No	No
Overfishing?	Yes	No	No	No	No	No

4.2.2 Objective 2: Reduce reliance on DAS allocations to control fishing morality

The Amendment 10 rationale for this objective stated:

> *"Day-at-sea allocations, crew limits, and gear restrictions have effectively lowered fishing mortality, but during times of low productivity, it becomes increasingly difficult to reduce day-at-sea allocations below current levels. In addition, day-at-sea allocations can sometimes be an imprecise way of controlling fishing mortality, due to uncertainties in the number of vessels that will fish, the number of days they actually use, and the amount of fishing time expended per day. Other limits on fishing could reduce the risk associated with this uncertainty.*
>
> *Also, during the 1990's, the amount of landings from scallop vessels not on a day-at-sea was negligible. As the limited access day-at-sea allocations were lowered and the resource rebuilt, there were more concerns over this source of fishing mortality with few regulations. The uncertainty associated with this lightly regulated source of mortality could be lowered by accounting for this source of mortality before making limited access day-at-sea allocations or by increasing the day-at-sea regulations to encompass more vessels that target sea scallops."*

4.2.2.1 Days At Sea Usage

The evaluation considered available information about DAS allocation, usage, landings, and fishery dependence to assess performance of the rotational program related to the Amendment 10 objective. Figure 28 shows the number of allocated and fished DAS from 2003 to 2020, as well as the percent landings from DAS and access areas for the Limited Access fleet from 2012 to 2020. Amendment 10 measures substantially reduced the number of allocated DAS by separating open and access area allocations. Following implementation of the Amendment, allocated open area DAS have continued to decline and dependence on DAS fishing was lowest in the most recent years at ~30% of total landings. Figure 29 shows monthly open area LPUE from 2011 to 2020. LPUE measures catch rates per day and exhibits an annual seasonal pattern with highest values in the spring at the start of the fishing year, declining to annual lows in the winter. Annual LPUE declined between 2011 and 2016, then increased between 2017 and 2019. Fishing year 2020 LPUE declined to similar levels observed in 2015 to 2016. Figure 30 shows the cumulative open area days fished for 2013 to 2021 (through August). Proportional to annual DAS allocation, open area effort by month was consistent between 2013 and 2018. In 2019 and 2020, open area effort was relatively lower at the start of the fishing year (April) and higher in early summer (June) than previous years. This shift was driven by reduced open area effort in the Mid-Atlantic in spring and increased open area effort on Georges Bank in summer (Figure 31).

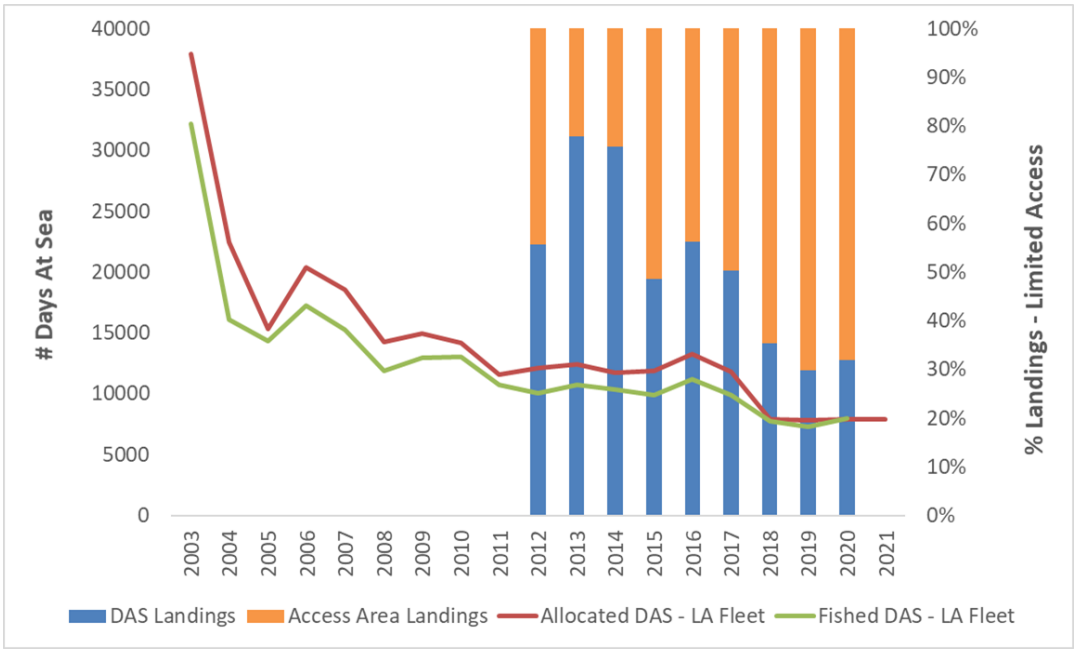

Figure 28. Number of allocated and fished DAS from 2003 to 2020, and percent landings from DAS and access areas for the Limited Access fleet from 2012 to 2020.

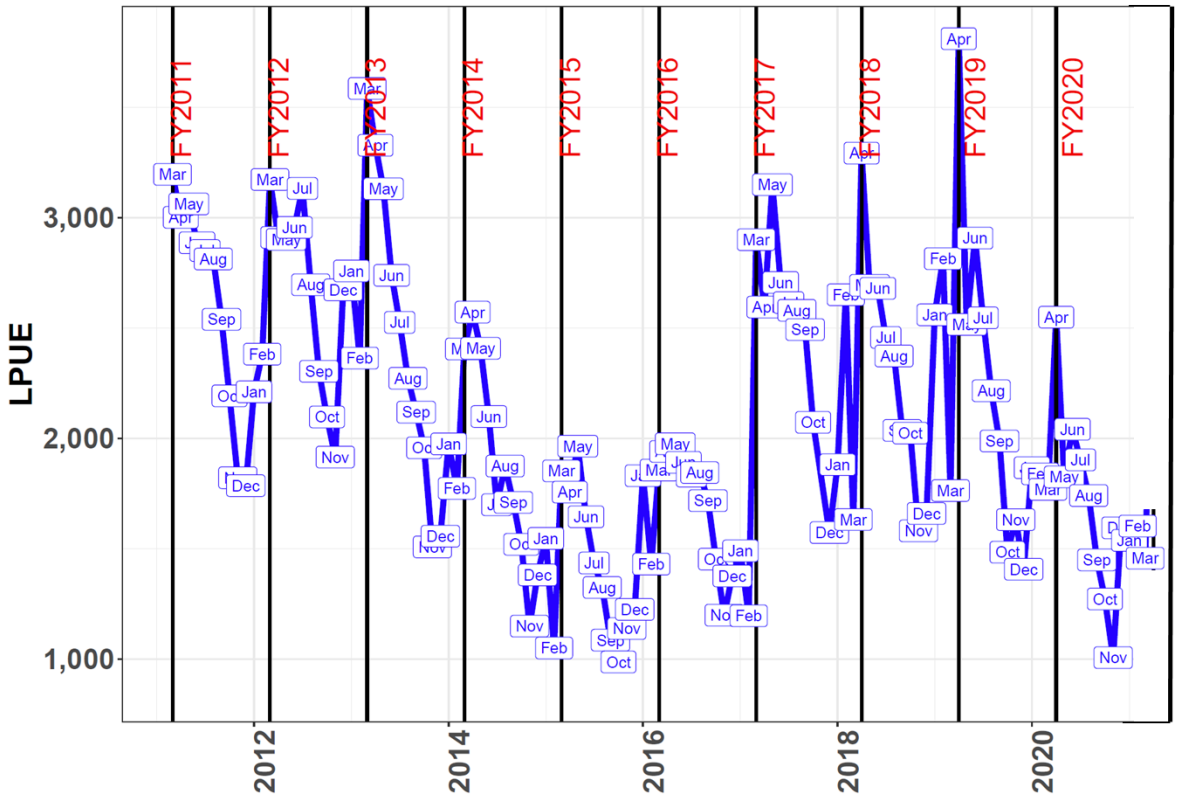

Figure 29. Monthly open area LPUE from Fishing Year 2011 to 2020.

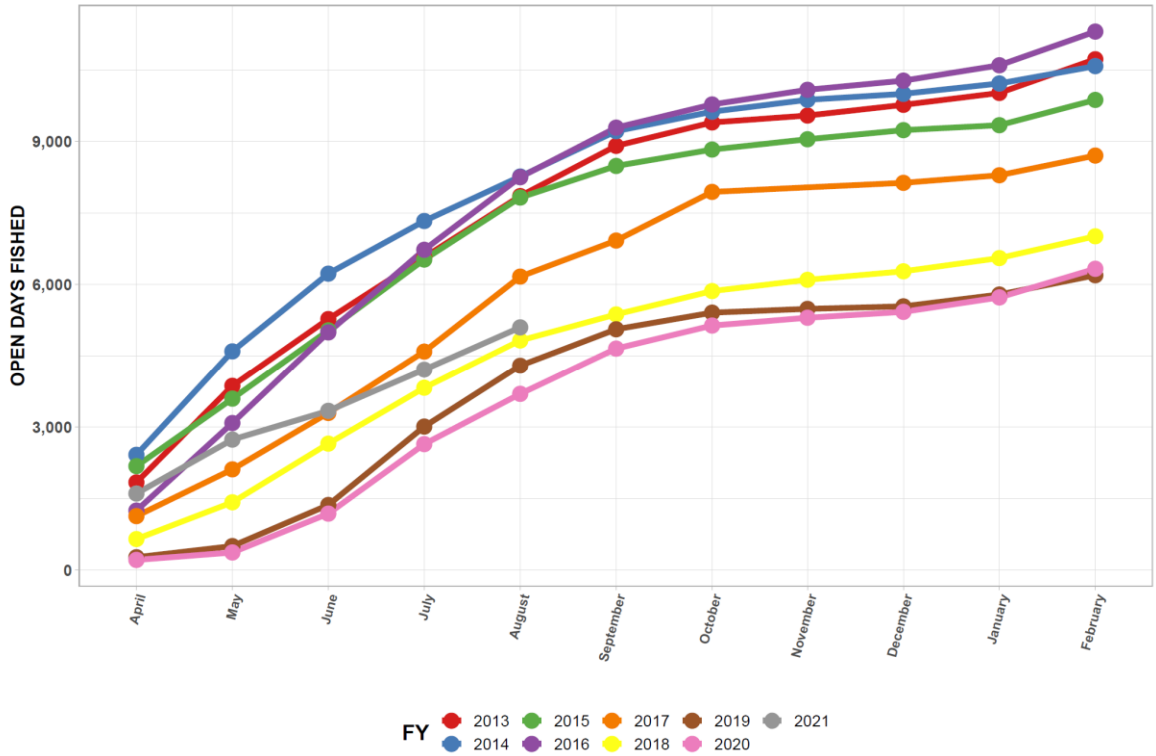

Figure 30. Cumulative open area DAS fished by month for 2013 to 2021 (through August).

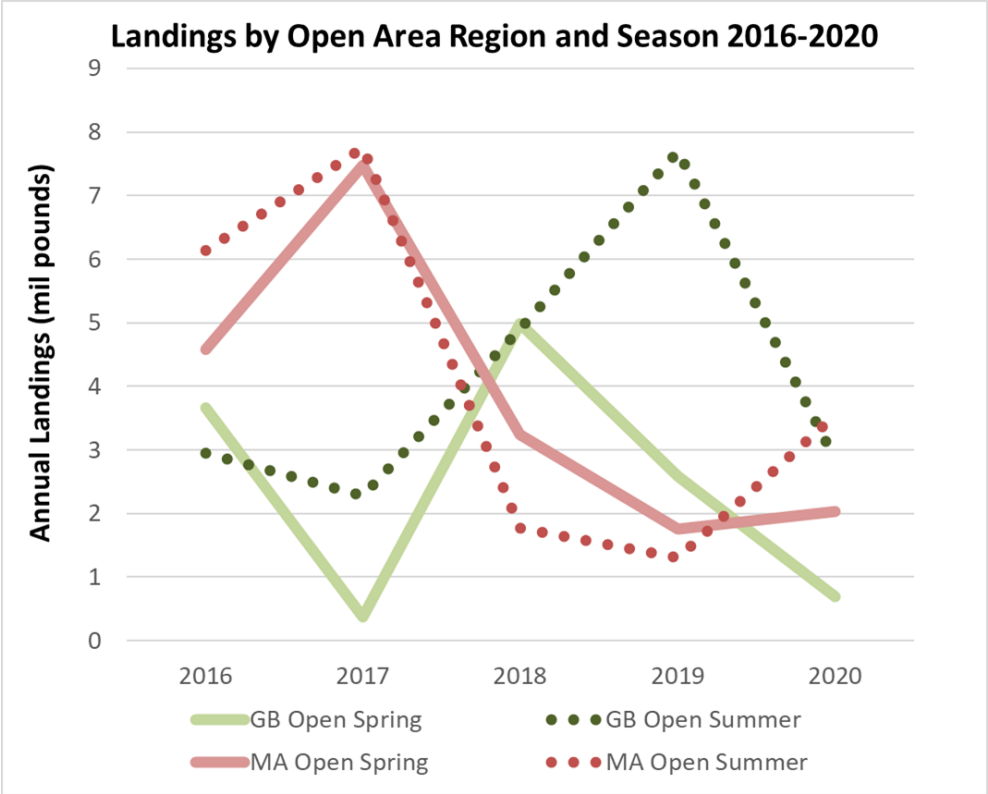

Figure 31. Landings by open area region (Georges Bank and Mid-Atlantic) and season (spring and summer) for 2016 to 2020.

4.2.2.2 Days At Sea by Ports

Open area landings dependence by port was considered as a measure of fleet behavior and opportunity. Figures 32 and 33 show area-specific landings for the New England region compared to the Mid-Atlantic (New York state and south) region, as well as by top scallop ports. Figure 32 shows landed scallop meat weight by access area and open area from 2014 to 2021 by region, with a clear indication of higher open area landings in the New England region, driven by landings in the port of New Bedford. Figure 33 shows open and access area landings from top scallop ports. Higher proportional open area landings from northern ports are reflective of several factors influencing fishing behavior. Lower LPUE in open areas in the southern region of the resource has resulted in different open area fishing opportunities between the Georges Bank and Mid-Atlantic regions with differential landings by port region. The difference in percentage of open to access area landings is seen proportionally across latitude with less open area landings in the southern-most ports over time, except Point Pleasant from General Category IFQ vessels. The Great South Channel has regularly been a highly productively scallop resource area, and in recent years has produced some of the highest yield scallops in open areas from the overall resource. Landings from fishing in the Great South Channel have concentrated in northern ports, specifically New Bedford for Limited Access Vessels, and to a lesser degree in Cape Cod ports from General Category IFQ vessels.

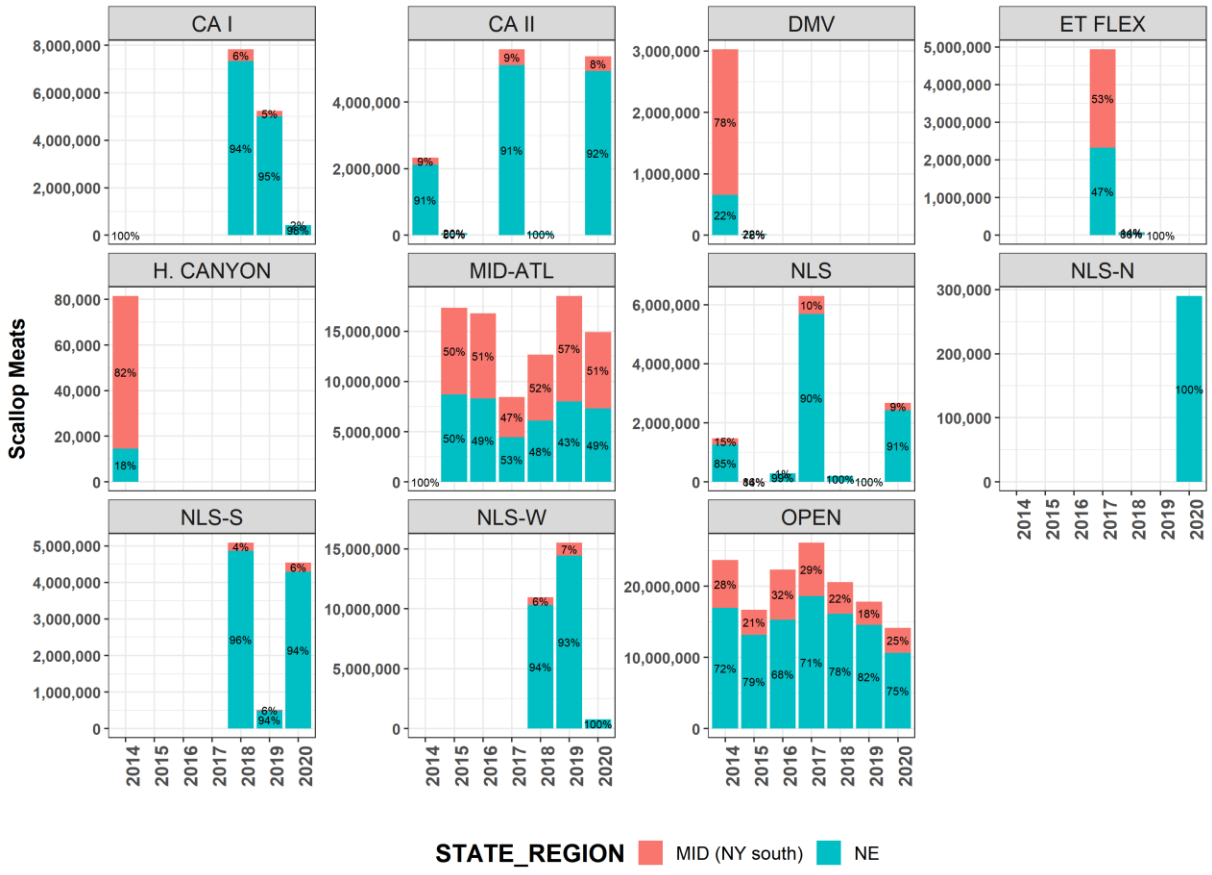

Figure 32. Landed scallop meat weight by access area and open area from 2014 to 2021 by region.

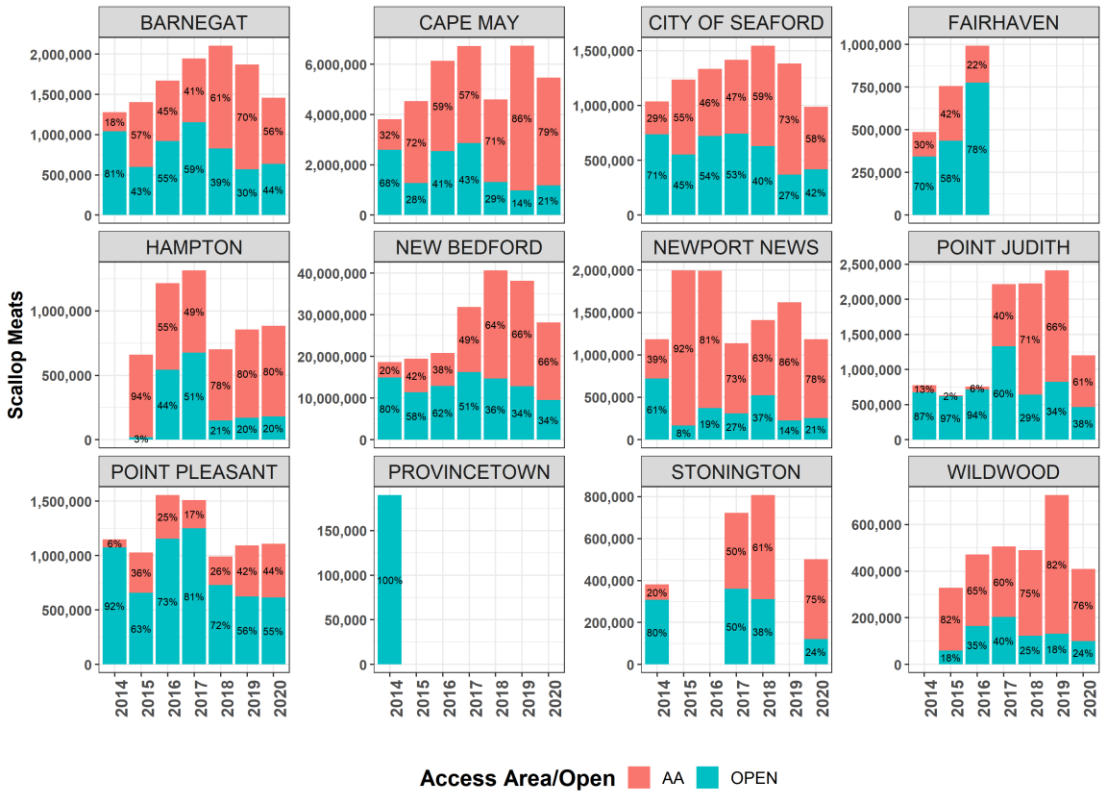

Figure 33. Landed scallop meat weight by port from access area and open area from 2014 to 2021.

4.2.3 Objective 4: Reduce and/or minimize bycatch mortality and habitat impacts

To be completed

4.2.4 Objective 7: Continue controlled access to groundfish closed areas in the context of area rotation management

To be completed

4.3 Objective 3: Describe How Rotational Management Is Being Used Relative to Original Approach, Describe Outcomes and Rationale for New Approaches

4.3.1 Amendment 10 Rotational Management Guidelines

Amendment 10 did not adopt standard closure area boundaries, dimensions, or durations for the rotational management program. The fully adaptive area rotation scheme includes guidelines as part of the framework process that should be used to establish the rotational areas, but they are

not requirements for the program. The guidelines are described below, but the Council and NMFS may deviate from these guidelines to achieve optimum yield or achieve other plan objectives.

Boundaries and distribution of rotational closures

Amendment 10 set up the area rotation program to be as flexible as possible, and allow boundaries to be established in future frameworks, rather than prescribed fixed boundaries and schedules. Amendment 10 guidelines describe that the size of areas should be large enough in shape to be effective, while allowing flexibility. Amendment 10 considered five scallop management regions, each approximately 75 square nautical miles in area. The five "regions" are: Gulf of Maine, Georges Bank, South Channel, Hudson Canyon, and Southern region.

Overall, the guidance recommends no more than one scallop rotational closure in each region at any time, except the Gulf of Maine. In that region there may be zero or one at any time. Areas indefinitely closed to scalloping are not considered rotational closures, but areas temporarily closed to scalloping by measures outside of the scallop rotational system may be considered for this purpose. Specific area size minimums were described in Amendment 10 as well, suggesting that new areas should be at least six or nine contiguous ten-minute squares depending on the region.

Amendment 10 guidance also suggests maximum closure guidance. First, all closures combined should not close more than 25% of the total exploitable biomass for the entire resource when a new closure is considered. Second, new closures should not result in total area closed to scalloping (including all closed areas, not just scallop rotational areas) to exceed more that 50% of the productive blocks in a particular region, or 75% or more of the scallop biomass in a subregion. Guidelines are included for incorporating seasonally closed areas as well.

Amendment 10 guidelines suggest that straight lines form all boundaries, and the internal angles between lines should not exceed 180 degrees. And when possible, the boundaries should follow edges of ten-minute square blocks.

Guidance for closures

Rotational area closures will be implemented by ad hoc or standard framework adjustments. Identification of appropriate areas should be based on either a combination of NMFS survey and industry-based surveys, or industry-based surveys alone. When possible, closures should be selected to include blocks where annual potential growth increase will exceed 30% in the absence of fishing, plus blocks with annual potential growth of 15% or more, while incorporating as few other blocks as possible. When it is not possible to include all of the blocks with high annual potential growth, preference should be given to closing those with higher values.

Blocks abutting a block in either the Georges Bank or South Channel regions that itself meets the annual potential increase requirements of the basic rule may be included in a closure if the directions of water movement are such that dispersal of scallops into the additional block from a closure is probable. Other blocks will only be added to closures when essential to meet the requirements of the invariable rules.

Monitoring and re-opening

1. All closed blocks will be surveyed annually by a commercial scallop vessel with a NMFS survey dredge to determine current biomass, size composition and growth rates. These surveys will also extend over all blocks immediately adjacent to a closed one. They will also cover all blocks currently subject to re-opening TACs.
2. NMFS receives the data and calculates the "annual potential increase" of the scallops in each closed rotation area.
3. Block closures re-open when appropriate and defined by framework adjustment or whenever the Council sets a default opening date when the area closes, unless:
    a. The discovery of additional seed of younger year-classes, during the period of a closure, requires extension of that closure,
    b. The shaping of new closures requires re-opening in advance of the expected year, or
    c. An early re-opening is made under an Emergency Action (e.g., if mass mortality of scallops in closure is suspected).
    d. No other alterations to the timing of re-opening may be made without an Amendment.
4. For each re-opening, a TAC will be set, based on survey estimates (corrected for catchability) of harvestable biomass and, for most blocks, a target fishing mortality rate calculated by applying time averaged mortality calculations. The biomass estimates will include scallops in all blocks immediately adjacent to the re-opening, provided that they will be open in the coming year. Such blocks will then be subject to the same TAC control as those in the re-opened area.
5. Based on the annual fishing mortality target for a re-opened area, a TAC will be calculated and the number of trips to allocate will be determined using a scallop possession limit which the Council will determine. Controlled access day-at-sea allocations will be calculated using a DAS/possession limit tradeoff that the Council establishes.

Setting fishing mortality in access areas (Amendment 10 and Amendment 15 guidelines)

Amendment 15 to the Scallop FMP implemented the hybrid overfishing definition, which includes a method for setting fishing mortality targets for the fishery. Specification packages consider what fishing mortality rates should be set using the principles approved in Amendment 10 and Amendment 15. For access areas, the F_{target} can fluctuate over time to allow more fishing pressure when they are open due to the increased biomass accumulated while they are closed. While the PDT does not suggest a very high F for access areas, it does suggest that the access areas can support a higher F than open areas that receive constant fishing pressure. For the most part, the strategy the PDT has used since Amendment 10 is to "ramp-up" fishing mortality targets in reopened access areas. The first year might be fished at a rate of 80% of the time averaged target, the second year at 100%, and the third year at 120%. This approach is consistent with the adaptive area rotation strategy considered in Amendment 10 and is considered more risk averse and reduces variability in landings.

4.3.2 Flexibility Measures Implemented after Amendment 10

4.3.2.1 Flex Allocations

The Council utilized "flex trips" or "flex allocations" in FY2017, FY2019, and FY2020 to provide additional flexibility to scallop vessels when fishing in access areas. Vessels are given the option to fish flex allocations in multiple areas as way to allow effort to be shifted out of a rotational area if there is uncertainty around the biomass estimate and(or) the area's ability to support the level of harvest allocated to it. The rationale for developing flex allocations was not tied directly to Amendment 10; however, as highlighted through the examples below, the Council's use of this tool has been consistent with maximizing industry flexibility to adjust to resource variation (i.e., a secondary objective outlined in the original rotational management plan).

Flex allocation was first used in the Elephant Trunk-Flex ("ET-Flex") rotational area in FY2017 (Framework 28; Figure 34). Prior to FY2017, the ET-Flex was closed to the scallop fishery to protect the high density concentration of both pre-recruit and exploitable scallops observed there by optical and dredge surveys. For FY2017, the Council elected to turn the closure into an access area and allocate a flex trip that could be fished either in the ET-Flex or Mid-Atlantic Access Area. The purpose of the flex trip was to allow the Limited Access fishery to distribute effort more broadly in rotational areas within the Mid-Atlantic region (i.e., MAAA, ET-Flex) and to reduce discard and incidental mortality on smaller scallops in the ET-Flex area. The majority of flex trips were taken in the ET-Flex area (79%) while only 21% were taken in the MAAA (Table 8). A comparison of the relative landings suggests that fishing in the ET-Flex area was more productive than the MAAA with a higher proportion of larger market category scallops and higher average LPUE (Figure 35).

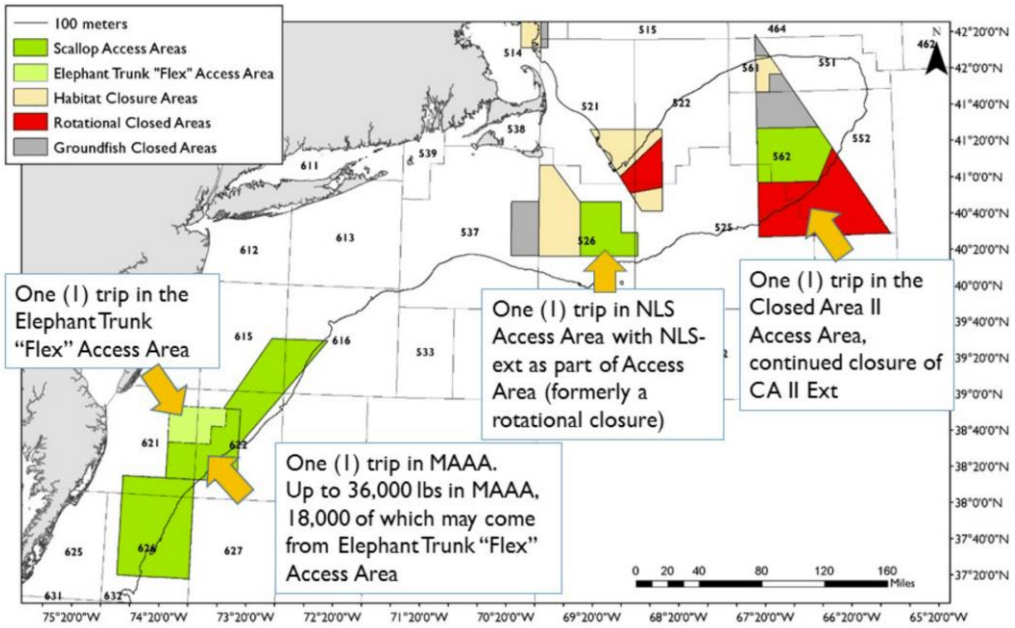

Figure 34. FY2017 spatial management areas showing the Elephant Trunk Flex area in light green (from NEFMC, 2017).

Table 8. Flex allocation usage in terms of landings (pounds), percent landings, and number of vessels by area for FY2017, FY2019, and FY2020.

Fishing Year	Flex Option	ET-Flex	MAAA	CAI	NLS-W
2017	landings (lbs)	4,546,117	1,189,306		
	landings (%)	79%	21%		
	number of vessels	228	214		
2019	landings (lbs)		1,294,709	4,726,158	65,465
	landings (%)		21%	78%	1%
	number of vessels		192	231	29
2020	landings (lbs)		2,398,523	147,977	
	landings (%)		94%	6%	
	number of vessels		221	18	

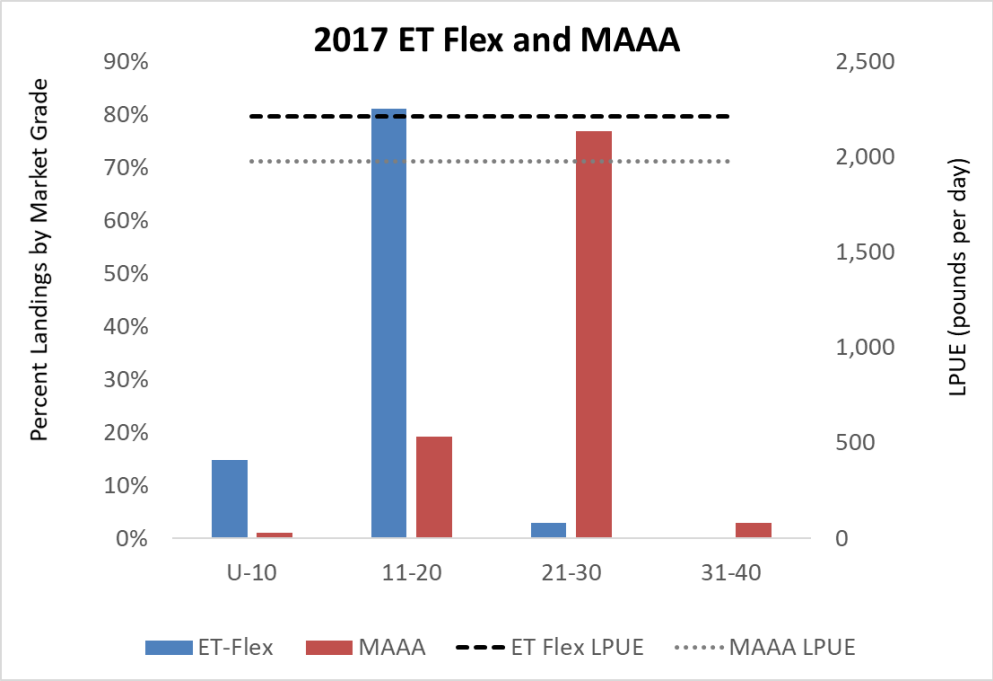

Figure 35. The proportion of landings by market grade from the ET-Flex and MAAA in FY2017. LPUE is shown on the secondary y axis.

In FY2019, the Council allocated an 18,000-pound flex allocation in Closed Area I to full-time Limited Access vessels, which could be fished in Closed Area I, the Nantucket Lightship West, and(or) the Mid-Atlantic Access Area. The use of flex allocation evolved in FY2019 compared to FY2017 in that vessels were not constrained to fishing the flex pounds in only one of two areas, but rather had the option to fish any amount of their flex allocation in any of the three available areas. This option allowed vessels to broadly distribute effort in the event that CAI biomass projections were overly optimistic and could not support the level of harvest associated

with a full trip. The majority of the FY2019 flex allocation was landed from Closed Area I (78%) and the remaining pounds were harvested from the MAAA (21%) and Nantucket Lightship West (1%; Table 8). The low utilization of flex pounds in the NLS-West was likely based on this area having the lowest LPUE (approximately 2,100 pounds per day) and smallest market grade scallops compared to Closed Area I and the MAAA (Figure 36). The distribution of landings by market grade and LPUE for the FY2019 flex allocation suggests similar market grades in the MAAA and CAI, with slightly larger scallops being landed from the MAAA, as well as slightly higher LPUE compared to CAI (Figure 36). Despite more favorable market grades and LPUE in the MAAA, higher flex trip utilization in CAI was likely driven by higher price premiums. Average prices for U10 and 10-20 count scallops from Closed Area I were $12.44 per pound and $10.13 per pound, respectively, which were 32% and 12% greater than average prices from the MAAA for the same market grades (i.e., $9.43 per pound and $9.01 per pound, respectively; Table 9).

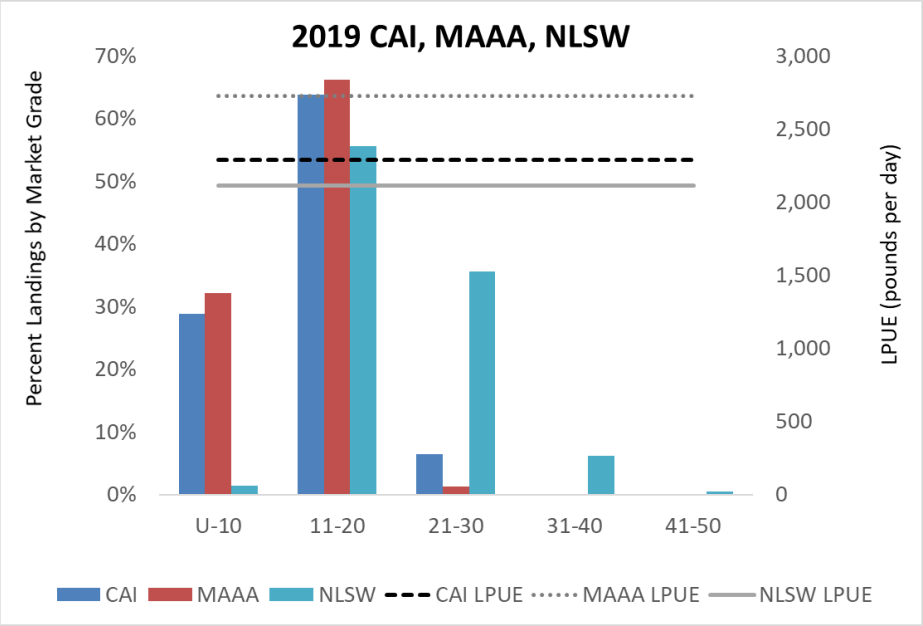

Figure 36. The proportion of landings by market grade from Closed Area I, MAAA, and NLS-West access areas in FY2019. LPUE for each area is shown on the secondary y axis.

Table 9. Average price per pound (total landings/total value) by market grade and rotational area in FY2019. Average prices are representative of all landings, not just the flex allocation that could have been fished in Closed Area I, the Mid-Atlantic Access Area, and the Nantucket Lightship -West.

FY2019				
market grade	CAI	MAAA	NLSW	NLSS
10 AND UNDER COUNT	$12.44	$9.43	$9.95	$10.62
11-20 COUNT	$10.13	$9.01	$8.54	$8.52
21-30 COUNT	$9.78	$9.00	$8.49	$8.47
31-40 COUNT			$8.15	
41-50 COUNT			$6.57	
UNCLASSIFIED	$12.06	$9.15	$8.72	

In FY2020, a "half trip" (9,000 pounds) flex allocation was made for Closed Area I that could be fished in either Closed Area I or the MAAA. This flex allocation followed the same concept as in previous years, which was to allow effort allocated in one area to be redistributed to another area at a vessel's discretion in the event that exploitable biomass projections for that area were overly optimistic. In FY2020, CAI had been fished for two consecutive years and projections suggested that there was only enough biomass for a partial trip to the Limited Access fishery. Allocating a partial trip (9,000 pounds) to the entire fleet to CAI was viewed as a more equitable approach compared to using a lottery, which had been previously used to provide partial access to areas with low biomass. In FY2020, 94% of the flex allocation was harvested from the MAAA while only 6% of landings came from Closed Area I (Table 8). This shift in effort out of CAI was likely driven by the notably higher LPUE and larger market grade scallops in the MAAA (Figure 37). LPUE was ~2,300 pounds per day and the majority of landings were 11-20 count in the MAAA, compared to an LPUE of ~1,400 pounds per day in CAI (about 40% less than MAAA) with the majority of landings comprised of 21-30 market category scallops.

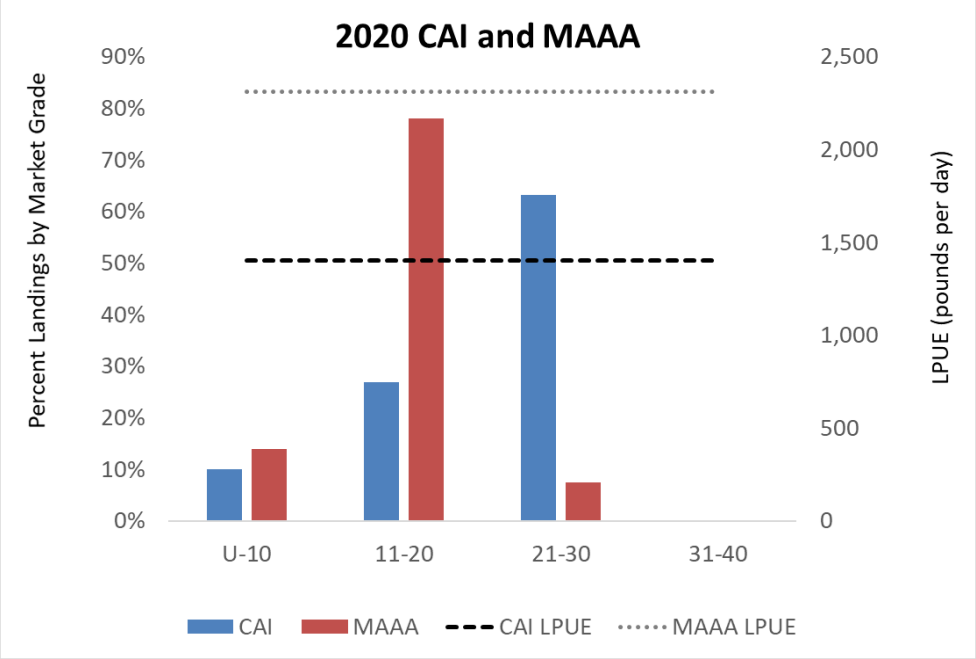

Figure 37. The proportion of landings by market grade from CAI and the MAAA in FY2020. LPUE for each area is shown on the secondary y axis.

4.3.2.2 Broken Trips and Allocation of Access Area Pounds

Amendment 10 allowed vessels to terminate trips in access areas for emergency, weather, or other conditions and receive credit to complete the trip at a later time within the same fishing year. The Amendment included several provisions to "prevent abuse" of the broken trip allowance by charging DAS and actual time at sea even if the vessels had no landings. In 2015, under Framework 26, access area accounting changed from trips to pounds. Vessels were given a poundage allocation for access areas that could be harvested using any number of trips, but still restricted to a possession limit. With this provision, vessels were no longer required to submit broken trip reports or compensation trip requests. The accounting system was updated to

accommodate this change and NMFS provides information for each vessel's allocation of pounds through the Fish-on-Line accounting system. Additionally, this provision removed the requirement for vessels to break a trip in the last 60 days of the fishing year in order to qualify to carryover access area allocation into the next fishing year.

Allocating in pounds rather than trips has not resulted in major changes to fishing behavior or impacted performance of the rotational management program. Examination of trip duration by area, which is an indicator of fishing behavior, between 2015 and 2021 did not show significant differences in the number of days absent following the change in allocation method (Figures 38 and 39). The pound accounting system relaxed the Amendment 10 broken trip regulations that proved to be unnecessary to prevent abuses related to annual carryover and is in line with secondary objectives of Amendment 10, including maximized industry flexibility, minimized regulatory complexity, and improved safety at sea. The provision provided additional flexibility for vessels to harvest their full allocations in access areas and reduced the accounting workload of captains and NMFS regulatory staff. As currently implemented, pound accounting provides vessel owners with near real-time information about their balance of scallop allocations per area and has reduced reporting burdens.

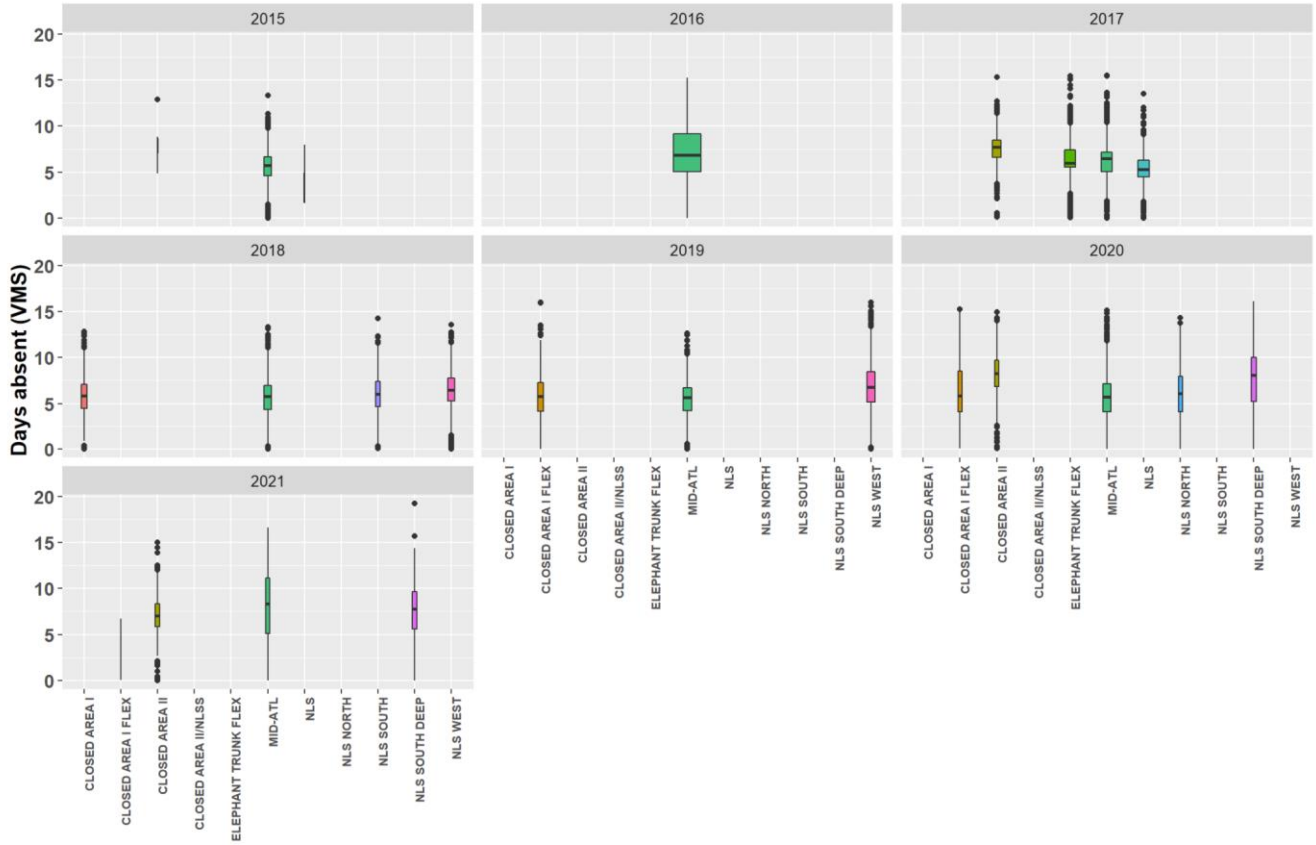

Figure 38. Days absent (as reported through VMS) boxplots by year for all access areas; boxes represent the interquartile range with median value as the black horizontal line, whiskers include the range of days absent with outliers shown as black dots.

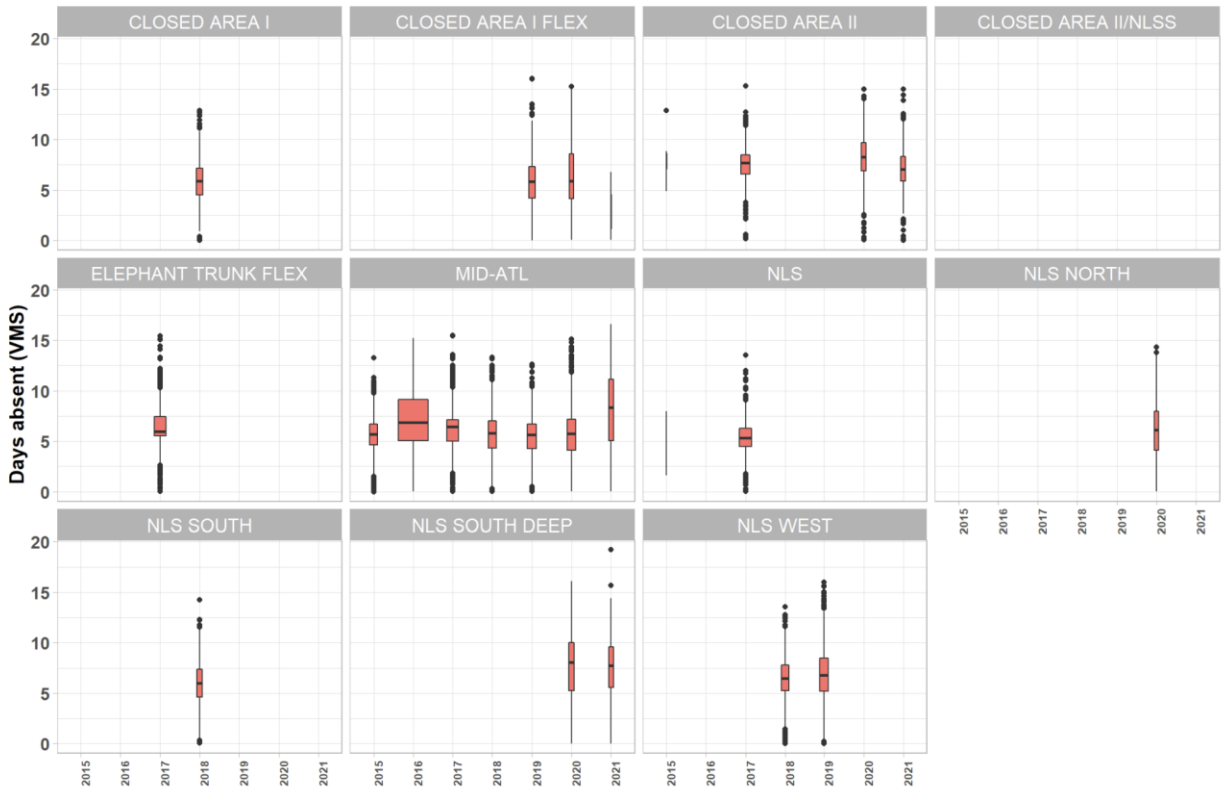

Figure 39. Days absent (as reported through VMS) boxplots by access area between 2015 and 2021; boxes represent the interquartile range with median value as the black horizontal line, whiskers include the range of days absent with outliers shown as black dots.

4.3.2.3 Access Area 60-Day Extension

Following implementation of Amendment 10, Framework 18 (FY2006) liberalized the broken trip provision that required all access area allocations to be harvested in the same fishing year. The Council recognized that this measure could lead to safety risks by forcing fishing near the end of the fishing year when weather conditions could be at their worst. The Council adopted the 60-day carry forward provision which allowed vessels to fish unharvested access area pounds in the first 60 days of the subsequent fishing year. The measure stipulated that trips that were broken during the last 60 days of the fishing year could be taken during the first 60 days of the following year. Further, the measure restricted the carry over only to access areas that were scheduled to remain open in the subsequent year, and if the area did not re-open, the allocation could not be carried forward. As noted in Section 4.3.2.2, Framework 26 removed the requirement for a trip to be broken in the final 60 days of the fishing year and instead all access area allocation was allowed to carry forward into the following year, including areas that were not re-opening.

The 60-day access area extension measures have provided flexibility to the industry and increased safety at sea. Table 10 shows the percentage of harvested pounds from access areas from the allocated fishing year and 60 day extension period for Fishing years 2017 to 2020. In this timeframe, the majority of allocated scallops in all access areas was harvested within the fishing year. Small percentages of scallop landings in the first 60 days of the subsequent fishing

year suggest that the carryover provision provides needed flexibility for vessels that cannot complete harvest within the 12-month fishing year.

Table 10. Percentage of access area allocation harvested within the allocation fishing Year (% Harvest Month 1-12) and within the 60 day carry over period (%Harvest Month 13-14) for all open access areas between 2017 and 2020.

FY	Area	Allocation (lbs)	% Harvest Month 1-12	% Harvest Month 13-14
2017	CAII	6,246,000	99%	1%
2017	ET-Flex	6,246,000	93%	7%
2017	MAAA	6,246,000	93%	7%
2017	NLS-North	6,246,000	97%	3%
2018	CAII	7,884,604	97%	3%
2018	MAAA	12,492,000	96%	4%
2018	NLS-South	6,246,000	91%	9%
2018	NLS-West	12,492,000	89%	11%
2019	CAI-Flex	6,246,000	93%	7%
2019	MAAA	18,738,000	95%	5%
2019	NLS-West	18,738,000	95%	5%
2020	CAI-Flex	3,123,000	84%	16%
2020	CAII	6,246,000	91%	9%
2020	MAAA	12,492,000	96%	4%
2020	NLS-North	3,123,000	96%	4%
2020	NLS-South	6,246,000	84%	16%

There were few instances where >10% of the allocation was harvested in the 60 day carry over period. In 2018, the Nantucket Lightship West had an allocation of ~12 million pounds (2 trips with 18,000-pound possession limit), of which 11% percent was harvested in the first 60 days of FY2019. Scallop meat yield in this area is highest in the spring months, and it is likely that the delayed harvest of scallops into the subsequent fishing year resulted in reduced mortality as fewer scallops at higher weight were harvested to fill vessel allocations (Figure 40). Similarly, in 2020, 16% of the Nantucket Lightship South allocation was harvested in the first 60 days of the following fishing year. Scallops in this area exhibited anomalous growth and delayed harvest likely resulted in landings of higher market categories in the spring months than would have occurred in winter (Figure 40). The same pattern of increased market category landings in the 60 carry over period was observed from CAI following FY2020 (Figure 40). In addition to increased industry flexibility and potential benefits to the scallop resource from reduced mortality, the 60 day carry over provision has increased safety at sea by allowing captains to avoid fishing in bad weather conditions in winter months.

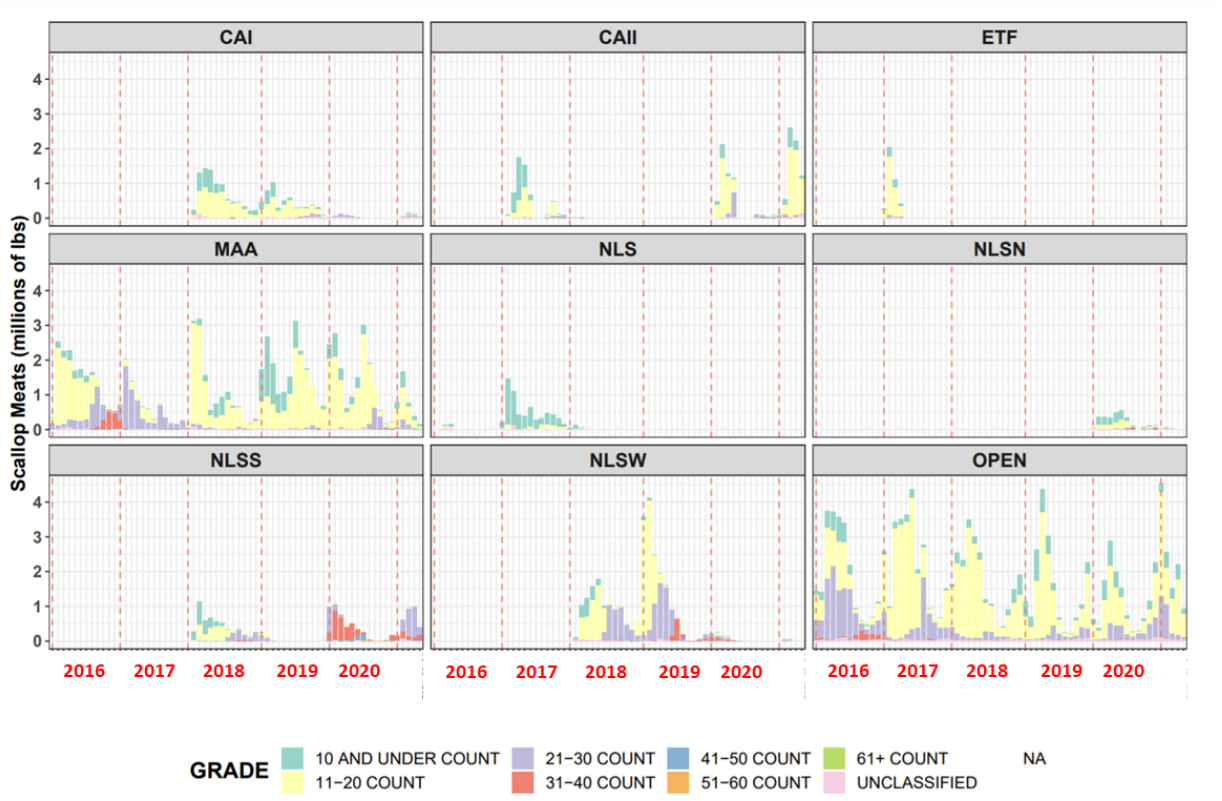

Figure 40. Scallop landings by grade within access areas and open areas for fishing years 2016 to 2021 (August).

4.3.2.4 Trip Trading

Amendment 10 recognized that some limited access vessels would not be able or inclined to fish in distant controlled access areas (e.g., Closed Area II). The Amendment included a provision to accommodate existing fishing practices by allowing Limited Access vessels to exchange access area trips with another Limited Access scallop vessel that would prefer to fish in an area closer to its port (NEFMC, 2003). The "trip trading" provision was originally implemented as a one for one exchange of trips between vessels, including vessels under the same ownership.

In 2020, under Framework 32, the trip trading provision was modified to allow trading in lower poundage increments for full-time Limited Access vessels. This change was intended to improve flexibility for individual vessels. Allocating partial trips and allowing access area allocations to be exchanged at the lowest increment of allocation (i.e., 9,000 pounds) was viewed as an equitable, alternative approach to a lottery system. The measure was intended to allow each vessel to pursue fishing opportunities that made the most sense for them.

4.3.2.5 Performance of Flexibility Measures

Generally, the measures to increase flexibility of the rotational management program that have been implemented since Amendment 10 have been in line with original intent and objectives of the amendment and have met expected management and fishery outcomes. The evaluation indicates that "flex allocations" can provide equitable opportunities for the fleet to harvest scallops in access areas that cannot support full trips, but consideration of price differential by

area should be included when analyzing flex options. Allocation of access area pounds instead of trips has not substantially changed fishing behavior but has increased complexity in scallop accounting by NMFS. The 60 day access area carry over provision has increased safety at sea, provided additional flexibility for vessels and potential reduced mortality on scallops but can confound scallop projections when fishing and surveys overlap spatially and temporally. The evaluation suggests that annual scallop specifications should consider past performance of flexibility measures to inform future decision-making.

4.4 OBJECTIVE 4: DESCRIBE TWO-YEAR SPECIFICATIONS ACTIONS AND EVALUATE OUTCOMES

Following implementation of Amendment 10, scallop specifications were set biennially for several years. There was an exception for FY2010 as Framework 21 was developed simultaneously as Amendment 15. The following Framework Adjustments included two year specifications:

- Framework 16/39 – Fishing Years 2004 and 2005
- Framework 18 – Fishing years 2006 and 2007
- Framework 19 – Fishing Years 2008 and 2009
- Framework 22 – Fishing Years 2011 and 2012

The evaluation examined the performance of two-year specifications included in Frameworks 18, 19 and 22 to consider outcomes and suggest recommendations for future decision-making on scallop specification frequency.

4.4.1 Framework 18 – 2006-2007 Specifications

4.4.1.1 Management Measures

Georges Bank Access Areas

The Council recommended modifications to the access area schedule on Georges Bank with no changes in boundaries. Five trips were allocated in 2006, specifically two trips in the Nantucket Lightship access area and three trips in Closed Area II, including a reassigned trip from the Closed Area I access area. The primary reason this alternative was selected was the result of the court's decision in *Oceana v Evans* (2 August 2005), which restricted Closed Area I access area to a smaller region. The Council determined that scallop catch rates would decline, causing increases in fishing effort, bycatch, and habitat impacts with no benefit. Closed Area II was capable of supporting another trip without exceeding the rotational area fishing mortality target. In 2007, two trips were allocated, including one trip in Closed Area I and one trip in Nantucket Lightship access area.

Hudson Canyon Access Area (HCA)

Survey data from 2005 indicated that scallop biomass in the Hudson Canyon area was much less than had been predicted by Amendment 10 from 2003 survey results. Catch rates dropped quicker than had been anticipated, and many vessels took sub-optimal trips in 2005 or chose to delay taking their 2005 access trips. The Council recommended extending the duration of the

Hudson Canyon area access program to reduce this problem. It allowed limited access vessels with unused 2005 trips to delay taking them until 2006 or 2007 and closed the area to vessels using open area DAS. No new Hudson Canyon Area trip allocations were made, effectively closing the area to fishing except for 2005 trips that vessels carried forward for use in 2006 and 2007. This alternative was predicted to spread out effort over time, allow time for existing scallops and new recruits to grow, and reduce fishing mortality because vessels might postpone taking 2005 trips. The PDT calculated that fishing mortality in the Hudson Canyon Area would be several times higher than the 2005 target if the entire TAC were caught and landed in 2005. Furthermore, the Council selected to extend the Hudson access program because of the positive economic impacts; under the recommended action vessels could lower their costs and increase their profits by taking trips when catch rates increased relative to the 2005 levels.

Elephant Trunk Access Area (ETA)

Amendment 10 closed the ETA to scallop fishing in July 2004 to protect two very strong year classes and anticipated that the scallops would reach optimum size for harvest in 2007. Framework 18 considered several alternatives for managing this access area including how many trips should be allocated, when the area should open and whether or not the area should be closed seasonally to reduce the risk of interactions with sea turtles and reduce scallop and finfish discard mortality. The Council selected precautionary initial trip allocations and set-asides. Five trips were allocated to the area based on limiting the maximum catch to a fishing mortality target of 0.16, as compared to 0.32 under the status quo. The rationale for the precautionary approach was that some projections for previous controlled access area programs had overestimated biomass and the TAC. Additionally, fishing more than five trips per vessel during a fishing year was determined to likely have undesirable effects, including higher safety risks, greater effects on the bottom environment from discarded scallop viscera, and a spike in landings, which may adversely affect price. The Council recognized that the cumulative value of economic benefits with the precautionary allocation would be larger in the long-term.

The Council also approved a rulemaking process that would allow the Regional Administrator to adjust allocations in the ETA based on updated biomass projections. If biomass estimates were lower than projected, the number of access trips could be reduced quickly using event-triggered rulemaking. The Council approved this procedure for reductions in trips only, intended to be used when the initial five trip allocation would cause the fishing mortality to exceed the F=0.32 target. If updated biomass estimates were higher than originally projected, the number of ETA trips would remain the same, allocations would not increase. This provision would allow adjustments to be made more quickly to ensure that the ETA allocations did not cause overharvesting. This type of change might have otherwise taken six months to a year to make.

Delmarva Access Area (DMV)

High numbers of small scallops from the 2003 year-class were observed by the 2005 survey in many stations in the proposed Delmarva rotation area. The Council recommended that the area close in 2007 when the Elephant Trunk area re-opened (January 1, 2007). The Delmarva area would remain closed for three years until 2010 when the small scallops would have grown sufficiently to be harvested. Under this action, the DMV Area was proposed to be re-opened to fishing on February 28, 2010, but future framework adjustments could define how it would be managed as a controlled access area. The Council determined that closing Delmarva would

ensure the continued success of the Scallop FMP by maintaining a high yield per recruit and productivity from the strong year class of young scallops that were found in that area (south of ETA). Closing the area was expected to boost landings by 15% during 2010-2014. Closing the area was also expected to increase the landings of more valuable scallops (U-10s) by 180%. Furthermore, aligning the DMV closure with the ETA opening would prevent the entire Mid-Atlantic from being closed at the same time. The economic impacts were estimated to be negative in 2007 because the area would be closed, but slightly positive over the long-term (2008-2019).

Open Area Allocations

Framework 18 analyzed 10 options with different combinations of Georges Bank access areas, access into ETA, access into Hudson Canyon, and whether or not the Delmarva area would be closed in 2007. The Council approved 20,000 open area DAS, which translated to 52 DAS for full-time vessels in 2006 and 51 DAS in 2007. The Scallop PDT considered various aspects of the fishery, resource, and ecosystem and recommended that in order to achieve optimum yield, the open area DAS allocations should not exceed 20,000 DAS. Although more DAS could have been allocated to achieve an overall F=0.20, higher open area DAS use was expected to cause overharvesting of the open areas, causing a loss in long-term yield from areas not under rotational area management.

4.4.1.2 Performance

Framework 18 was implemented through Final Rule on 8 June 2006, over three months after the start of FY2006 (1 March 2006). The Georges Bank access areas that were opened, Nantucket Lightship (3 trips) and Closed Area II (2 trips) both closed in-season due to reaching the Georges Bank yellowtail flounder TAC. Despite high levels of scallop biomass in the Georges Bank access areas, the trip allocations did not align with available bycatch quota resulting in lost scallop yield in FY2006. The projected biomass increases in Hudson Canyon for 2006 and 2007 did not occur, and trips that had been delayed from 2005 were not completed. The event-triggered rulemaking provision for ETA was implemented for FY2007 reducing allocation from five trips to three as biomass was less than projected under Framework 18. Overall, the two-year projections of biomass in the Mid-Atlantic were overly optimistic. Inclusion of the event-triggered provision to reduce allocation in the ETA proved to be effective to avoid a delay in action to prevent exceeding fishing mortality targets but increased complexity of the framework, which in turn increased time of development and contributed to the delayed implementation in the first year.

4.4.2 Framework 19 – 2008-2009 Specifications

4.4.2.1 Management Measures

Georges Bank Access Areas

The Council recommended revising the order of access area openings on Georges Bank. Specifically, this action only allocated one trip in one access area per year on Georges Bank (Nantucket Lightship in 2008 and Closed Area II in 2009). The Closed Area I access area did not open under this framework action. The rationale for this decision was that the biological projections indicated that only one access area trip should be allocated per year to meet overall

mortality objectives and optimize yield. The exploitable biomass in Closed Area I was not expected to support an allocation of even one trip.

Hudson Canyon Access Area

The Council recommended that all un-used 2005 Hudson Canyon trips would expire at the end of FY2007. The Council did not believe any unused trips should be used past 2007. It was argued that Framework 18 already provided a two-year extension to vessels that did not use their Hudson Canyon trips allocated in 2005. One Council member pointed out that continuously allowing vessels to carry over trips in the future gives the industry a false impression that access area trips are guaranteed and do not have to be taken during a specific time period. The PDT voiced concern that extending trips too far into the future can compromise the effectiveness of area rotation, since very specific levels of effort are expected for specific time periods and when that effort is shifted to later times or different areas it can potentially lead to overfishing.

Elephant Trunk Access Area

The Council recommended that seven trips be allocated to this area for full-time vessels, 4 trips in 2008 and 3 trips in 2009. The Council supported opening the area on March 1 for both years and noted that if the biomass in that area was lower than expected based on updated biological projections, then allocated effort in that area should be reduced in 2009. In addition, if the updated overall fishing mortality estimate was above the threshold, then the number of trips allocated in 2009 should be reduced by the equivalent of one full-time trip. This procedure was adopted to make use of a more rapid, event-triggered rulemaking to correct the ETA allocations, ensuring that optimum yield was achievable even if there was insufficient time to develop a framework adjustment when the new ETA biomass data became available. There was uncertainty in the projected scallop biomass in the ETA. In addition, this area contained about one-third of the total scallop biomass; therefore, managing this access area with caution was necessary to preserve the long-term health of the scallop resource and fishery. Overharvest of the resource in this area could have undermined the goals and objectives of area rotation.

Delmarva Access Area

Based on survey data and information about growth rates in the Mid-Atlantic, the Council supported an early re-opening of Delmarva in 2009 at a reduced level equivalent to one full-time trip allocation for the area. The Council supported this allocation in an effort to stabilize landings and allocate effort in areas with higher catch rates to reduce costs and impacts on the scallop resource, EFH, protected resources, and non-target species. The Council supported the alternative that would reduce effort in Delmarva in 2009 based on updated biological projections because there was uncertainty in the projected scallop biomass in the Delmarva area. The uncertainty resulted from the substantial majority of young scallops, whose true abundance was difficult to estimate with a high degree of precision.

Open Area Allocations

The Council supported an open area DAS allocation of 35 DAS in 2008 for full-time vessels and 42 DAS in 2009. When all of the access area allocations were combined together with these open area DAS, as well as expected mortality from the general category fishery and other sources, the overall fishing mortality rate was expected to average F=0.20 over the two-year time period. The Council supported this alternative because it was expected to achieve the fishing mortality target

needed to achieve optimum yield on a continuing basis. This strategy included more effort in access areas than in open areas, reducing DAS used, increasing catch per unit of effort, and reducing time that gear is in contact with the bottom.

Area Closure to Protect Small Scallops

Results from the 2007 survey suggested that small scallops settled in the vicinity of the Hudson Canyon Access Area. The Council considered several boundary alternatives and supported inclusion of the existing Hudson Canyon area (HC) as a new rotational closed area. The Council selected this area for closure because it contained most of the 2007 survey tows with high numbers of scallops. The industry and enforcement agencies were familiar with this area and the closure was not expected to have impacts on vessels that fish in areas outside the HC area.

4.4.2.2 Performance

Framework 19 was implemented through Final Rule on 29 May 2008, nearly three months after the start of FY2008 (1 March 2008). Nantucket Lightship was closed early in 2008 and Closed Area II was closed early in 2009 due to reaching the Georges Bank yellowtail flounder TAC. Similar to Framework 18, allocations to the Georges Bank access areas did not align with available bycatch quota resulting in lost scallop yield in 2008 and 2009. Exploitable biomass in Hudson Canyon did not increase as predicted in 2006 and the Council decided to end carryover of 2005 allocated trips. Conversely, recruitment was observed in the Hudson Canyon Area and the area was closed under the rotational management program to allow growth and increased yield. The event-trigged provision to reduce allocation in the Elephant Trunk Area was included in Framework 19 but was not applied to reduce trip allocations in 2009. Biomass projections conducted in 2007 for FY2009 were not overly optimistic and the area supported the Framework 19 allocations. Overall, Framework 19 measures performed relatively well for the two-year specification period, but allocations were lower than Framework 18 measures.

4.4.3 Framework 22 – 2011-2012 Specifications

4.4.3.1 Management Measures

Framework 22, implemented immediately following Amendment 15, was the first specification action that included new provisions for OFL, ABC, ACL and ACT. The framework was based around new requirements for SSC-approved ABC values that were set associated with a fishing mortality rate that had a 25% probability of overfishing. The "ABC flowchart" was introduced to include scientific and management uncertainty and specified sub-ACLs for the Limited Access and Limited Access General Category fleets. Framework 22 also introduced the "lottery system" where half of the fleet was allocated access to one area and the other was allocated to a different area. The measure was designed to allocate as much effort through trip allocations in an area as possible. For FY2011, all vessels were allocated one trip each in Closed Area I, Hudson Canyon and Delmarva, then half of the fleet was allocated an additional trip to Closed Area I and the other half was allocated a trip in Closed Area II depending on which area the vessel was assigned based on the results from the randomized lottery allocation. For FY2012, the lottery system became more complex. Each vessel was allocated 1 trip to Closed Area II and 1 trip to Hudson Canyon, then each vessel was allocated two additional trips based on the randomized lottery, which included Closed Area I, Nantucket Lightship, Hudson Canyon and Delmarva.

4.4.3.2 Performance

Framework 22 was implemented through Final Rule on 21 July 2011, nearly five months after the start of FY2011 (1 March 2011). The reason for the late implementation was due to the Amendment 15 implementation date, which was the same day. FW22 measures were contingent upon approval of Amendment 15 and could not be implemented prior to NMFS' approval of the amendment. Amendment 15 and Framework 22 were reviewed by NMFS simultaneously to ensure that measures were in accordance with the 2007 reauthorization of the Magnuson Act. Surveys conducted in 2011, prior to and after the framework's implementation, indicated that scallop biomass in Delmarva was substantially lower than projected for FY2012, which was confirmed by much lower than anticipated fishery catch rates in FY2011. Results showed that biomass in Delmarva was not high enough to support the FY2012 allocations set through Framework 22 and an Emergency Action to close the area was announced on 15 May 2012. Because the fishery allocation to Delmarva was based on the lottery system, the Council decided to reallocate FY2012 Delmarva trips to Closed Area I to maintain equitable allocations across the entire fleet. It was unknown at the time that the scallops in Closed Area I were exhibiting poor meat quality due to old age and grey meat disease. Closed Area I was not able to support full harvest of the FY2012 trips or subsequent FY2013 trips and was closed to fishing during FY2013 with unharvested trips remaining on the books until FY2018 when a larger portion of the area opened under OHA2. The Elephant Trunk Area was reverted to open bottom under Framework 22 and DAS fishing was allowed in this region. The 2012 scallop surveys observed a very high abundance of small scallops in the area and the PDT recommended closing the area to protect the pre-recruit scallops. An Emergency Action to close Elephant Trunk was announced on 12 December 2012, which was subsequently extended through Framework 24. Overall, the two-year specifications included in Framework 22 led to several management challenges as overly optimistic projections required Emergency Action to close Delmarva, the lottery system did not anticipate reallocation from one area to another, and survey observations of the changing resource could not be incorporated in a timely manner except through Emergency Action for the Elephant Trunk Area. Additionally, the increased complexity associated with Amendment 15 requirements prolonged the development timeline to set two-year specifications. In 2012, the Council decided to limit Framework 24 to set measures for FY2013 only due to uncertainty associated with the high recruitment levels in the Mid-Atlantic, Georges Bank yellowtail catch levels, and potential changes in habitat closure boundaries. Since FY2013, specifications have been set annually in the scallop FMP.

4.4.4 Overall Performance of Two-Year Specification Actions

The evaluation suggests that there is value in adjusting specifications on an annual basis based on the performance of the two-year specification actions described. Annual adjustments to scallop specifications require substantial staff and PDT resources and have become increasingly complicated over time (Table 4). Given these trade-offs, the PDT recommends exploring options for making annual adjustments to the scallop specifications using a more streamlined process that can incorporate results from annual surveys. The Council has not used a specifications-only process which was created in Amendment 19, nor has there been serious consideration of using a Supplemental Information Report (SIR) to reduce the annual workload for specifications.

4.5 Objective 5: Identify Possible Changes or Areas for Improvement for Rotational Management

To be completed

4.5.1 Conclusions of the Evaluation

DRAFT Preliminary conclusions include:

- The rotational management program has substantially evolved since the implementation of Amendment 10 in 2004.
- Goal 1:
    - Evaluate how original objectives (A10) of the rotational management program have been met
        - The rotational management program has achieved many of the primary and secondary objectives outlined in Amendment 10.
- Goal 2:
    - Evaluate how the current version of rotational management meets expected outcomes
        - New approaches have been incorporated since the creation of the Mid-Atlantic Access Area and partial approval of Omnibus Habitat Amendment 2.
        - Exceptional year classes introduced new challenges for science and management.
        - Projection uncertainty is a persistent issue that adds complexity to the rotational management system.
        - The plan has added several measures to increase flexibility for the industry, including Flex Trips, allocation in pounds, carry over provisions and trip trading.
        - Anomalous growth rates and increased mortality has been observed in recent years in specific areas (Nantucket Lightship West and the Mid-Atlantic Access Area) resulting in management interventions and less than optimal yield.
        - Overall, annual management measures have become more complex to include additional surveys and address the changing resource.

4.5.2 Recommendations for improvement

DRAFT Recommendations for improvement include:

- Evaluate projection uncertainty
    - SAMS model review and GeoSAMS model development
    - “Life cycle” of a rotational management area

- Consider performance of flexibility measures for future actions
    - Factors that influence fishing behavior
    - Accounting system
    - Evaluate DAS carry over provisions

- Evaluate spatial scale
    - Optimal size for rotational management areas

- Streamline Council process for updating specifications
    - Specifications outside of the FW process
    - Maintain annual specifications, reduce number of alternatives that require NEPA analysis
    - Coordinate survey system – Scallop Survey Working Group